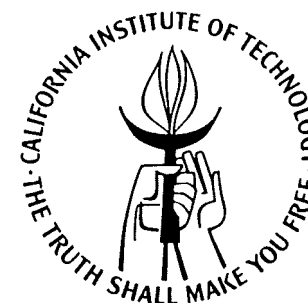


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IMPERFECT INFORMATION IN MARKETS FOR CONTRACT TERMS:
THE EXAMPLES OF WARRANTIES AND SECURITY INTERESTS

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Abstract

The existence of imperfect information is thought to provide firms with incentives to degrade contract quality by supplying terms that well-informed consumers would refuse. We show, in contrast, that these incentives are weaker than is commonly supposed; rather, when consumers gather relatively little information, the profit maximizing strategy for firms is likely to involve offering the contract terms that consumers prefer, but at supracompetitive prices. In consequence, a standard state response to imperfect information problems, regulating the substantive terms of transactions, is often misplaced. When imperfect information exists, the state instead should reduce the costs to consumers of comparison shopping for contract terms, because such shopping reduces prices and also reduces further the incentive of firms to degrade contract quality.

IMPERFECT INFORMATION IN MARKETS FOR CONTRACT TERMS:

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Imperfect information is commonly assumed to exist when consumers cannot choose contract terms that correctly reflect their preferences because consumers are uninformed about the risks that these terms allocate. Firms are said to exploit this ignorance by degrading contract quality. For example, if consumers believe products to be more reliable than they are in fact, consumers will too readily accept disclaimers, which shift the risk of product defects to them; and firms will respond by using disclaimers frequently. This conventional focus is misleadingly narrow. Consumers also are disadvantaged when they are unaware of the array of prices and terms that the firms in a market can offer. Consumers who lack this information may accept poor deals because they do not know that better ones exist; and firms will have little incentive to offer better deals because these will not be taken.

The notion that imperfect information exists when consumers cannot choose correctly and the more novel notion that imperfect information exists when consumers are ignorant of market opportunity sets both imply that firms will respond inadequately to consumer preferences. A focus on the latter form of imperfect information, however, yields insights that differ strikingly from those that can be

derived from the notion of imperfect information as incorrect choice. This view implies two forms of regulation: (i) Firms should be made to explain transactions to consumers, so consumers can choose correctly, or (ii) Firms should be prohibited from degrading contract quality by using such terms as disclaimers. By focusing on the notion of imperfect information as ignorance of market opportunity sets we identify an additional problem. Suppose, as an example, that the consumers of a particular product are well informed about defect risks and prefer a warranty to a disclaimer, but these consumers lack information about the range of prices and warranty terms that the market offers. We show that firms in this circumstance are much more likely to supply warranties at supracompetitive prices than refuse to provide them altogether. Hence, even when consumers are sufficiently informed about risks to choose contract terms correctly, an information problem may exist; firms could be charging supracompetitive prices for terms in response to consumer ignorance of market possibilities. Conventional legal analysis completely overlooks this problem.

We argue here, however, not that supracompetitive pricing is an overlooked information problem in "markets for contract terms," but that often it is the only problem sufficiently serious to justify regulatory concern. This is because the incorrect choice problem arises only in a limited set of cases. If consumer mistakes respecting the risks that contract terms allocate fluctuate randomly around true values in an unbiased way, firms will act as if consumers

made correct choices. If consumers are "pessimistic," systematically overstating the adverse consequences of purchase decisions, firms in many cases again will act as if consumer choices were correct. Also, pessimism causes consumers to demand more protection in the form of favorable contract terms than their better informed selves would choose, and such overprotection has not been thought to raise serious policy problems. Consequently, firms will degrade contract quality in undesirable ways only if consumers systematically understate the adverse consequences of purchase decisions. Consumers may be "optimistic" in this way if they lack data about risks or if they misprocess relevant data so as to understate its negative implications. In most cases, neither possibility is likely. Consumers have incentives to become informed about important risks, and the evidence indicates that they often act upon these incentives. Also, an analysis of the psychological literature dealing with cognitive error suggests that consumers in the aggregate seldom misprocess product related data such that they act optimistically. An exception to these conclusions is constituted by transactions in inexpensive, frequently purchased products that will cause serious personal harm a very low percentage of the time, of which the paradigm example is the purchase of soda in a bottle that later explodes. We show that the consumers in these transactions are unlikely to search for information about the low risk of harm, and may respond optimistically to whatever information about this risk comes their way.

The notion of imperfect information as ignorance of market opportunity sets thus implies a regulatory scheme that differs significantly from the ones now in place. Decisionmakers should "improve" contract quality by banning contract terms much less frequently than they now do. Instead, decisionmakers should attempt to identify and prevent supracompetitive pricing for those contract terms that are now in frequent use. Because comparison shopping reduces prices, this latter goal should be implemented both by providing consumers with explanations of transactions and by lowering the costs to consumers of comparing the prices and terms that firms offer.

Part I briefly summarizes current regulatory responses to the existence of imperfect information as it is thought to affect contract terms. Part II sets out our model of a market for warranties; Part III then sets out a security interest model. Warranty and security interest clauses allocate significant risks between consumers and firms in very different ways. Hence, conclusions drawn from an analysis of these clauses should generalize prima facie to other risk allocation terms in consumer contracts. Parts II and III for convenience introduce the policy implications that the models generate only as they concern warranties and security interests. Part IV next asks to what extent these implications are impeached when certain of the key assumptions underlying the formal models are relaxed. As an example, our model of a warranty market supposes consumers to know product failure probabilities perfectly. In Part IV, we drop this

assumption to consider the consumer optimism question just described. Part V then considers and rejects additional conceptions of the possible effects of imperfect information and sets out several recommendations for increasing comparison shopping for contract terms.

Before reaching the argument, two preliminary remarks should be made about it. First, we assume that the state should be satisfied with the existence of competitive outcomes in markets for contract terms. This premise follows naturally from a concern with imperfect information. The existence of imperfect information is a species of market imperfection that enables firms to charge supracompetitive prices or impose unwanted terms on consumers. The many regulatory responses designed to provide consumers with information or ameliorate the effects of its absence¹ thus must assume that competitive outcomes are desirable. This assumption also is justifiable because when a market is in competitive equilibrium, firms are providing goods and contract terms at the lowest possible cost consistent with the continued existence of these firms. Thus, supposing a given distribution of wealth, consumers cannot do better than purchase in competitive markets.²

Second, the economic and psychological theory relevant to contract performance under conditions of uncertainty is relatively primitive; ours, for example, are the only formal models of markets for contract terms that suppose it to be costly for consumers to acquire information about the offerings of different firms. Hence, our policy conclusions should be taken more as serious suggestions

than as hard recommendations. Policy suggestions grounded in theory, however, seem an advance over the atheoretical intuitions that now influence regulation in this area.

I. Regulation of Contract Terms

States respond to information imperfections that are thought to affect contract terms by requiring disclosure or by banning disfavored clauses. Disclosure regulation typically is more concerned with explaining the individual transaction to the consumer than with facilitating the consumer's ability to compare contract terms across firms. As examples, Regulation 226.b(a) to the Truth in Lending Law requires consumer credit disclosures to "be made clearly, conspicuously, [and] in meaningful sequence"; regulations 226.7(c)(1)-(3) require disclosure of the "conditions under which a finance charge may be imposed, including an explanation of the time period, if any, within which any credit extended may be paid without incurring a finance charge . . .", the "method of determining the balance upon which a finance charge may be imposed," and the "method of determining the amount of the finance charge"; and section 701.2 of the regulations implementing the Magnusson-Moss Warranty Act requires firms to provide a "step-by-step explanation of the procedure which the consumer should follow in order to obtain performance of any warranty obligation" Such regulation implicitly assumes that each consumer visits only one firm to make his first and last transaction of the type at issue.

Regulation of the substantive terms of transactions is also common. Six states ban warranty disclaimers in all sales of consumer goods,³ and section 108 of the Magnusson-Moss Act bans such disclaimers whenever a firm makes a written express warranty respecting the product,⁴ which is often done in sales of consumer durables. Also, almost all states have adopted the strict liability in tort doctrine, so that firms must warrant against defects that cause personal injury or property damage. In addition, when firms promise to repair or replace defective parts of consumer products, courts commonly require them to repair such products in relatively short order or to replace them; the promise to attempt to repair parts is converted into a warranty to supply a well functioning whole.⁵ States are beginning to adopt this rule by statute.⁶ The presumed existence of imperfect information is often given as a justification for all of this regulation. In addition, most findings of unconscionability depend crucially on the apparent presence of uninformed consumers.⁷ As a last example, the Uniform Consumer Credit Code prevents sellers from taking security interests in consumer goods,⁸ other than purchase money security interests, and several states have adopted the Code or passed laws similar to it.⁹ Extensions of these laws or new ones in the same vein are frequently proposed.

The regulation just summarized seemingly assumes that comparison shopping will seldom improve consumer welfare for much of it makes little effort to increase the amount of comparison shopping that occurs; and this regulation also assumes that what a consumer

learns in one transaction will not be applied in others like it.¹⁰ Statutes and legal doctrines that ban contract terms suppose that firms typically exploit the existence of imperfect information by offering terms that consumers would reject were they properly informed. This paper argues that all of these assumptions are wrong or problematic.

II. Warranty Markets

A. Conventional Views

The imperfect information concept has two aspects: (i) consumers may lack information about the risks that particular terms allocate; (ii) consumers may lack information about the prices and terms that different firms offer. Conventional explanations of the positive and normative features of warranties suppose that imperfect information in its second aspect is absent; consumers are assumed to know the market opportunity set perfectly. These explanations differ in their treatment of the first aspect of imperfect information. "Signalling" explanations suppose consumers to be poorly informed about product quality though perfectly informed about prices and terms. "Comparative advantage" explanations suppose that neither aspect of imperfect information exists, but sometimes consider how their conclusions would be affected were consumers uninformed about the risk of product defects. The authors of these explanations, however, seldom specify in detail the relationship between the models' assumptions and the models' results; and this failing obscures the crucial contribution to these results that is made by assuming

consumers to be perfectly informed about prices and terms. We shall begin, then, by making explicit the role that is played in the conventional explanations by the assumptions the models make about firms and consumers, as a useful prelude to our analysis of the effect on warranty coverage of the fact that consumers never know all elements of the market opportunity set perfectly.

(1) Signalling Explanations

Signalling explanations assert that a warranty signals the quality of a firm's product.¹¹ Such explanations suppose that: (i) Imperfect information in the first sense exists, in that consumers cannot distinguish among competing products on the basis of their likelihood of failure; (ii) Consumers believe that product quality correlates positively with the extent and duration of warranty coverage; (iii) The cost to firms of making warranties varies inversely with product quality; the more likely a product is to fail, the more expensive it will be to comply with warranties made respecting it; (iv) If firms do not communicate their quality levels to consumers, the consumers will suppose that each firm sells a product of "average quality." Consumers also will assume that the average is relatively low; should consumers suppose average quality to be high, firms would exploit this ignorance by offering low quality products at high quality prices. In consequence of these four assumptions, warranty coverage should correlate positively with product quality. Firms with products whose quality is above the low average that consumers perceive have an incentive to communicate this

fact. According to assumption (ii), they can successfully communicate their quality by making "strong" warranties. Assumption (iii) then implies that firms with poor products will be unable to imitate these warranty "signals"; such firms incur relatively greater expense in making strong warranties than do firms with good products because the former sell products that fail more frequently. Hence, supposing product quality often to be heterogeneous, a variety of warranties should exist, each of them signalling the quality of the product it accompanies.

Signalling explanations necessarily suppose consumers to have considerable knowledge about prices and contract terms, since firms have no incentive to send signals that will not be observed. Consequently, signalling models commonly add an assumption (v), that consumers can costlessly observe the prices and terms of every firm in the market. We sometimes refer to this as "the zero search cost assumption." This assumption is always false in fact, and its falsity seems at least partly responsible for the major difficulty with signalling explanations, their inconsistency with the data. Three counterexamples should suffice. First, signalling theory predicts that firms with more durable products will make warranties that extend over longer time periods. In contrast, actual warranties in given markets generally are made effective for identical time periods, which also are considerably shorter than the useful life of the products they accompany.¹² Second, signalling theory implies that warranties will not be made in commercial markets or will take a different form

there than in consumer markets. This is because firms are said to make warranties to inform otherwise ignorant consumer buyers about product quality, while many commercial buyers supposedly are well informed about product quality. Warranties in commercial markets, however, seem as common as those in consumer markets, and take quite similar forms.¹³ Third, a strong positive correlation between warranty coverage and product reliability often seems difficult to detect. For example, frequency of repair data, such as that reported in Consumer Reports, sometimes show wide variations among firms, but the products themselves trade under similar or identical warranties.

Signalling explanations, in summary, fail to account for important phenomena, and for these and other reasons¹⁴ are not useful for policy purposes. Part of the difficulty stems from their use of the zero search cost assumption. Analysis of signalling explanations thus suggests that light may be shed on warranty issues by abandoning it.

(2) Comparative Advantage Explanations

This second set of explanations accounts for warranty coverage by reference to the comparative advantages of firms and consumers in reducing the costs of or insuring against product defects.¹⁵ To see how such explanations work, suppose that (i) Firms can reduce the frequency of defects in refrigerator motors more cheaply than consumers can because firms have more expertise respecting motors, can take advantage of economies of scale in purchasing repair tools and so forth; (ii) Consumers can ensure the durability of refrigerator doors

and shelves more cheaply than firms can because the most efficient way to achieve durability for these items is through careful use; (iii) Consumers are perfectly informed respecting the risk that defects will occur and are aware of the steps necessary to reduce this risk; (iv) Consumers minimize net purchase costs; (v) Firms maximize profits; (vi) Search costs are zero--consumers can costlessly observe every price and contract term that all firms in the market do or could offer.

Under these assumptions, firms will offer an optimal refrigerator warranty contract. Assumptions (i) and (ii) imply that a contract exists that minimizes consumer costs associated with defects in refrigerators. Under this contract, firms would assume the risk of defects in motors--i.e. warrant against them--but shift the risk of defects in doors and shelves to consumers--i.e. disclaim this risk. Assumption (iii) implies that consumers would recognize the cost minimizing contract, and assumption (iv) ensures that consumers would purchase it were it available. Finally, assumptions (v) and (vi) imply that cost minimizing contracts will be offered. Since by assumption (vi) consumers can costlessly search for the cost minimizing contract, each firm knows that by offering it, the firm can take sales from rivals who offer different contracts. And by assumption (v), that firms are profit maximizers, firms would then offer this contract. Comparative advantage explanations thus predict that optimal warranties will emerge through the informed decisions of consumers and firms.

Comparative advantage explanations of warranty content seem plausible because consumers and firms do have differing abilities to reduce or insure against product related risks, and because consumers and firms often act as if they want to maximize profits or minimize costs. Also, these explanations account for some of what is actually observed. For example, Commercial Law does not require firms to repair or replace defective parts of consumer products; rather, it gives consumers a cause of action for the damages such defects could cause.¹⁶ Nevertheless, firms often warrant against defects in materials and workmanship. The comparative advantage theory predicts this result, for repairs of new products by firms often are less costly than repairs by consumers plus damage suits.

Comparative advantage explanations, however, have significant difficulties that also are traceable to the informational assumptions they make. These difficulties are perhaps best revealed by an analysis of the most recent serious comparative advantage explanation, that of Professor George Priest.¹⁷ Professor Priest's theory rests on the six assumptions just set out and one more, (vii), that consumers have heterogeneous preferences for warranty coverage: some consumers want broader coverage than others do. These seven assumptions imply that actual warranty coverage should be homogeneous in the ways in which consumers can be expected to be homogeneous. For example, all consumers would want coverage against defects in refrigerator motors, so all firms will offer basic coverage against such defects. The assumptions also imply that coverage should be heterogeneous in the

ways consumers can be expected to be heterogeneous; some consumers, those with large families for example, might want stronger than usual warranty coverage, so at least some firms should offer relatively extensive warranties. Priest then examined actual warranties and found that they "tended to confirm" his thesis, though "further research . . . is required before a confident conclusion can be reached."¹⁸ In brief, he observed patterns of homo- and heterogeneity in warranty coverage that seemed consistent with his theory, but in some cases the sample sizes were small and occasional counterexamples existed.

Professor Priest concluded that the coverage he observed probably was optimal. The consumers in his model were assumed to be perfectly informed about the risks of product defects and the best methods of avoiding them, and to want to minimize net purchase costs. Hence, they could recognize and would demand optimal warranty contracts. And because Priest also assumed search costs to be zero, he concluded that firms would offer optimal contracts.¹⁹ These contracts were as described--homogeneous in some respects but heterogeneous in others. A focus on the contribution of the zero search cost assumption to these results suggests that they require qualification.

Initially, Professor Priest has not shown that the contracts he observed reflected correct consumer choices. Suppose that consumers are imperfectly informed respecting the risk of product defects. Such consumers nevertheless could have heterogeneous

preferences for warranties; some may mistakenly think they need broad warranties while others mistakenly could think they need narrow ones. By assumptions (v) and (vi) above (firms maximize profits and search costs are zero), firms still will offer the warranties that consumers want. These warranties, however, will be inefficient. Hence, Professor Priest's observation of heterogeneous warranty coverage cannot establish his claim that consumer warranties probably reflect "manufacturer and consumer investments to optimize product services." To sustain this claim, the assumption that consumers can accurately value risks must be independently justified or shown to be irrelevant to efficiency analysis.

Professor Priest also cannot sustain his claim that the warranties he observed correctly reflected the preferences that consumers actually held. To see why, suppose that assumptions (vi) and (vii) above are relaxed; consumers now no longer face zero search costs but have homogeneous preferences--all want the same warranty coverage. Let assumptions (i)-(v) be as above. In these circumstances, the search theoretic economic literature suggests that firms may still offer diverse warranty terms. Analysts working in this literature commonly suppose all firms to sell a homogeneous product under a sales contract that has only one term, the price. Consumers consequently must have homogeneous preferences respecting this term; they want it to be as low as possible, which occurs when firms charge competitive prices. Thus, all consumers want to purchase at the competitive price. A standard result in this literature,

however, is that price diversity can exist when it is costly for consumers to inform themselves of the prices that different firms charge, even though all consumers prefer the same price.²⁰ Inferring that consumers prefer different prices because different prices are observed would plainly be a mistake; the heterogeneity in prices can only be the result of positive search costs.

Part II B, infra, next extends this standard result to the case of warranties, to show that when search costs are positive and all consumers prefer the same warranty, some firms nevertheless may not offer it; heterogeneous warranty coverage can exist in the face of homogeneous consumer preferences. Therefore, the diversity in warranty coverage that Professor Priest believed tended to confirm his theory could have been the result of heterogeneous consumer preferences, as he supposed, or the result of positive search costs--i.e. of imperfect information in its second aspect. If it was the latter, his conclusion that warranty coverage accurately reflected consumer preferences is incorrect. To exclude this possibility, one must analyze how warranty markets behave when the consumers in them face positive search costs. Neither Professor Priest nor any other comparative advantage theorist has made such an analysis.

To summarize, comparative advantage explanations of warranties correctly identify important determinants of warranty coverage but are too partial. They suppose search costs to be zero, but this assumption at best implies that markets will satisfy consumer choices, whether based on correct or false assessments of risk. Also, search

costs are never zero, and much economic analysis suggests that in this event markets often can be relatively unresponsive to consumer preferences. It is essential, then, to explore the comparative advantage idea in a world of positive search costs.

B. A Model of a Warranty Market

(1) A Simple Search Equilibrium Model

To understand the logic that underlies our analysis of warranty markets, it is helpful to begin with a relatively simple search equilibrium model. The word "search" refers to the process by which consumers become informed about the products, prices and terms that firms offer. The object of this class of models is to describe the outcomes--"equilibria"--that markets reach when consumers pursue specified "search strategies" (i.e. become informed in particular ways), and firms pursue specified profit maximizing strategies.²¹ An understanding of these models is essential to anyone concerned with the effect that imperfect information has on market performance.

We initially developed a search equilibrium model²² that supposed: (i) a large number of firms existed; (ii) these firms sold the same product--a "homogeneous" good--all of whose features were observable before purchase; consumers thus could not be uncertain about product quality; (iii) firms did not advertise, but instead communicated information to consumers when consumers visited them; (iv) a large number of consumers existed, each of whom would purchase no more than one unit of the product; (v) all consumers had a common "limit" price, which meant that every consumer would buy if he or she

observed a price which equalled or was less than this common limit, while no one would buy at prices above the limit; (vi) consumers became informed about prices by using a "fixed sample size" strategy. Each consumer, before entering the market, decided how many firms to visit, and would then visit all firms in the sample before purchasing; a purchase was then made at the lowest price observed, if that price was no greater than the limit price; (vii) consumers fell into two categories respecting this fixed sample size strategy; some of them had sample sizes of one--they would visit only one firm--while others had sample sizes greater than one.

Such models raise three questions: First, what results does the model yield? Second, are the model's assumptions sufficiently plausible or its predictions sufficiently confirmed for these results to be taken seriously? Third, if the results do deserve serious consideration, what are their implications?

A principal result of this model is that the only possible equilibrium in which all firms charge the same price occurs when that price is competitive. To see why, first suppose that all firms in the market charge the same price, " p_0 ", which is less than the common limit price, " p_L ", but greater than the competitive price, " p^* " (i.e. $p^* < p_0 < p_L$). Then let one firm lower its price below p_0 by a very small amount. This firm would sell to all "nonshoppers"--consumers who only visit one firm--who visit it; the price cutter would also sell to all "shoppers"--consumers who visit it and other firms--because its price would be the lowest one the shoppers observe. Thus,

price cutting would be a profitable strategy for the firm, if all other firms continued to charge the old price, p_0 . But these firms also have the same incentive to cut their prices. Consequently, an outcome in which all firms charged p_0 would be unstable, since at least some firms would undercut it; p_0 is not an equilibrium price. The competitive price, p^* , could be an equilibrium price because no firm would undercut it. This is because the competitive price by definition always equals each firm's minimum average cost, which means that the revenue from a sale just equals the lowest cost necessary to generate that sale. Since price cuts below this point must produce losses, firms have no incentive to reduce prices below the competitive level.

Suppose next that all firms are charging the competitive price, p^* . One firm then considers raising its price. If it does so, it would continue to sell to nonshoppers who visit it, provided that its new price does not exceed the limit price, p_L . This firm would not sell to shoppers, however, because its new price would be higher than the other prices that the shoppers see. Since the firm would lose all of the shoppers' business at any price above p^* and retain all of the nonshoppers' business at any price equal to or below p_L , this firm would charge p_L . Whether the strategy of raising price to the limit would be profitable necessarily depends on whether the gains made from charging p_L to nonshoppers would exceed the losses created by no longer being able to sell to the shoppers. If enough shoppers existed, raising prices would be a losing strategy. Therefore, the

competitive price would be the equilibrium price in a particular market if enough comparison shopping took place.

If too few comparison shoppers existed to sustain a competitive equilibrium, many firms might still charge the competitive price. Other firms, however, would find it profitable to sell to a mix of shoppers and nonshoppers at supracompetitive prices. Thus, although the product is homogeneous and consumer preferences are homogeneous--all want to buy at the lowest price,--price dispersion would exist. Finally, if very few consumers comparison shop, raising price above the competitive level could be a profitable strategy for all firms: every price in equilibrium would exceed p^* , and for sufficiently few shoppers prices would converge toward p_L . We sometimes refer to p_L as the monopoly price because it is the price that a monopolist would charge if it operated in the relevant market, given our assumptions about consumer demand.

We have discussed the assumptions that generate these results elsewhere,²³ and so will say only a few words about them here. It is plausible to assume that consumers use a fixed sample size shopping strategy for three reasons. First, fixed costs to search sometimes exist--the main shopping expense could be getting to the shopping district--and a fixed sample size strategy minimizes these fixed costs by spreading them over visits to several stores. Second, search sometimes is a consumption activity; consumers who enjoy shopping thus may create and plan to exhaust a sample of several stores before they begin to search. Third, when consumers have little price information,

their strategy choice is either to set samples or let the amount of search they engage in be a function of the prices they see. As examples of the latter sort of strategy, a consumer who visited two stores and saw the same price at both might stop searching because he or she assumed that finding a significantly lower price would be unlikely; this consumer could infer from observing identical prices that little price variability existed. In contrast, a consumer who saw two different prices might search a great deal, believing significant price dispersion to exist. A strategy such as this makes the number of stores visited be partly a function of the prices one sees. Experimental evidence shows that this strategy is subject to misspecification, in the sense that consumers using it who are ignorant of the actual price distribution in the market may shop much less or much more than the variability in that distribution warrants. A fixed sample size strategy, in contrast, is less subject to such misspecification, and is thus a sensibly conservative strategy for consumers to adopt. Respecting other of the model's important assumptions, one of us has shown elsewhere that the model's qualitative results are unchanged if consumers may purchase more than one unit;²⁴ and these results will also obtain if each consumer is allowed to have an individual limit price.²⁵

This simple search model predicts that price diversity will sometimes be observed in actual markets, and it is. Also, the model predicts that market prices may be lowered if consumers can be induced to engage in more comparison shopping. Evidence drawn from actual

markets is consistent with this prediction.²⁶ Hence, the model's assumptions and predictions seem sufficiently plausible to warrant concern with its implications. What are they?

Initially, the model shows that information about market choices need not be perfect. A market can be in competitive equilibrium even though the ratio of comparison shoppers in it to total shoppers is considerably less than one. Such competitive equilibria are best achieved by increasing the amount of comparison shopping that takes place, for the model also shows that greater comparison shopping correlates positively with lower prices. These implications are drawn from a model in which firms sell a homogeneous product, but we have elsewhere shown that they also hold when firms are allowed to vary product quality.²⁷ The question we next take up, then, is the extent to which the lessons drawn from this relatively simple model must be modified when firms are allowed to vary contract quality.

(2) A Warranty Model²⁸

This model retains the assumptions about firms and consumers made above and also supposes that a homogeneous good is sold. It necessarily adds several assumptions which it will be useful to discuss in detail. These are: (i) Consumers do not know, when they begin to shop, which firms sell with warranties and which do not. Hence, the nonshoppers sample one firm at random from among all firms before purchasing, while the shoppers sample more than one firm at random from among all firms. This assumption is made to capture the

notion that consumers are imperfectly informed respecting the prices and terms that markets offer. We denote the ratio of nonshoppers to total consumers in the market by " a_1 " and the ratio of shoppers to total consumers by " a_2 "; $a_1 + a_2 = 1$; (ii) Consumers also are differentiated according to their desire for warranties. A consumer prefers a warranty, in this model, if a consumer who sees the product offered with a warranty at the competitive price and offered without a warranty at the competitive price would then purchase the product with the warranty. A consumer therefore is said not to prefer a warranty if he would be unwilling to pay the lowest possible premium that firms must charge to provide warranty protection. (iii) This model retains the assumption that consumers have common limit prices, but modifies it because a consumer now has the additional choice of buying with or without a warranty. We let " h_W " be the limit price, or "willingness to pay," for the product with a warranty and " h_N " be the limit price for the product without a warranty. Here, h_W always is greater than h_N because a warranty is a desirable product feature; thus, it would be irrational of a consumer to be willing to pay more for the product without a warranty than with one, even if the consumer prefers not to have warranties. This notation also allows us to capture more precisely the notion of a preference for warranties. The term $h_W - h_N$ can be regarded as a consumer's marginal willingness to pay for warranty protection. Then, a consumer prefers a warranty when $h_W - h_N > p_W^* - p_N^*$, where p_W^* is the competitive price for the product with a warranty and p_N^* is the competitive price for the product

without a warranty. Assumptions (ii) and (iii) further imply that a consumer who prefers a warranty in the sense just defined would purchase without a warranty if (a) he or she only saw the product offered without warranties, and (b) the price equalled or was less than the limit price, h_N . Similarly, a consumer who prefers to buy without a warranty will buy the product with a warranty if (c) he or she saw only warranties, and (d) the price equalled or was less than h_W . These limit prices incorporate all relevant information respecting consumer preferences. For example, other things equal, the spread between h_W and h_N will be greater if consumers strongly prefer warranties. (iv) Consumers now purchase one unit of a product that has a positive probability, " π ," of breaking and becoming useless; π is independent of the care with which the product is used, and is known to firms and consumers. Thus, although the relevant product can fail, once more no uncertainty about product quality exists. In the terminology used here, imperfect information in the first sense, dealing with the possible consequences of purchase, is absent.

Respecting the firms in the model, we add: (v) Firms produce the product with a fixed cost, " F ," and a constant marginal cost over some range, " c ." This marginal cost is incurred whether a warranty is made or not. Firms can sell with a warranty or without, but cannot do both. (vi) A warranty in this model consists of a promise, that is always redeemed, to replace any defective product with a new one at no charge.²⁹ (vii) Offering the product with a warranty does not directly affect each firm's marginal cost, but may require additional

fixed costs, " F' ." These additional fixed costs may arise from administrative or other expenses that a replacement program could cause. (viii) Marginal cost nevertheless is increased when a warranty is made. A firm that sells with a warranty must plan for the replacement of defective products, and the replacements also could be defective. Hence, the firm must produce more than one unit to "support" a sale of one unit; the total amount that must be produced per sale is $1/(1-\pi)$ where π is the failure probability. Then, with a constant marginal cost, c , the firm's total variable cost if it makes a warranty and sells x units is $cx/(1-\pi)$. Its marginal cost, called " c_W ," is this total variable cost divided by total effective output, or $c/(1-\pi)$, which is greater than c since π is positive but less than one. Finally, let " s " be the firm's output in competitive equilibrium when it sells without warranties. Then, a firm that sells with warranties has a total output in competitive equilibrium of " s_W ," where $s_W = (1 - \pi)s$. The output s_W is less than s because the firm must provide for replacements.

We next consider the model's results in two paradigm cases. In the first, all consumers prefer warranties. This case is considered because decisionmakers and commentators commonly suppose that consumers want more warranty protection than markets provide. Thus, it is useful to ask what is likely to happen when every consumer in a market wants a warranty but firms are permitted to disclaim. The second paradigm case considered is when no consumer prefers a warranty. The rationale for analyzing this case is set out below.

(a) All Consumers Prefer Warranties

Three mutually exclusive outcomes can occur in this case, of which the most desirable is that all firms offer the product with a warranty at the competitive price. Whether this outcome obtains is once more a function of the amount of comparison shopping in which consumers engage. The logic that underlies this result is similar to that described above. Let all firms in the market sell with warranties at a price $p_0 > p_W^*$, where p_W^* is the competitive price. Then every firm has an incentive to cut its price by a small amount because it would continue to sell to nonshoppers and capture all of the shoppers who visit it. The price cutting strategy is not profitable at prices below the competitive price p_W^* ; hence, a single price equilibrium can occur only if all firms charge this price. If all firms sell with warranties at p_W^* , a firm that wants to deviate in the price dimension will charge the limit price h_W because it sells only to nonshoppers. This would be an unprofitable strategy--i.e. a firm would have no incentive to deviate--if enough shoppers existed, for then the increased revenue gained from the nonshoppers would be more than offset by the losses resulting from the disappearance of the shoppers. A firm also could deviate from a competitive equilibrium, in which all firms sold with warranties at p_W^* , by offering the product without a warranty. This firm too would sell only to nonshoppers, for every consumer in the market prefers a warranty by assumption and each shopper would see at least one other firm selling with a warranty at p_W^* . Hence, a deviant firm not only would disclaim but also would

raise its price to h_N , the most consumers would pay when not getting a warranty. Again, if enough shoppers existed, disclaiming warranties while charging monopoly prices would be an unprofitable strategy. In summary, then, when all consumers prefer warranties and enough consumers comparison shop, the market will provide warranties at competitive prices.

Suppose that too few comparison shoppers exist to sustain a competitive equilibrium. The remaining possibilities are: Second, all firms sell with warranties although some or all of them charge prices that are supracompetitive; the market power that insufficient consumer search creates is manifested in the price but not the contract quality dimension. Third, some (possibly all) firms sell without warranties and charge supracompetitive prices. This outcome is plainly the least desirable. To see whether it or the second possibility will occur, we must introduce a particular concept of comparative advantage.

We define a comparative advantage with respect to firms by reference to the number of customers that a firm would need to break even when it charged the limit price--the highest price consumers would be willing to pay. If a firm, as a result of its cost structure and consumer preferences, would need fewer customers to break even when selling at the limit price with a warranty, we then say that the firm has a comparative advantage at selling with warranties. Similarly, if a firm would need fewer customers to break even when selling at the limit price without a warranty, the firm is said to have a comparative advantage at selling without warranties.

To understand why this concept of comparative advantage is relevant, suppose that all firms in the market offered the product with a warranty at p_W^* and one firm considered deviating. In this illustration, too few shoppers exist to make any deviation from the competitive case unprofitable. Because the deviant firm would sell only to nonhoppers, it would charge the limit price, but it now has the option of making a warranty and charging h_W or disclaiming warranties and charging h_N . If the firm would need fewer customers to break even when selling at h_W , it would then offer a warranty. This strategy yields higher profits because the firm reaches its breakeven point with fewer sales. On the other hand, if the firm would need fewer customers to break even when selling at h_N , the firm would disclaim warranties. When firms have a comparative advantage at selling without warranties--this third case--warranties could disappear altogether if very few consumers shopped, though every consumer preferred one. Should there be a fair number of shoppers, however, too few nonshoppers would exist to support every firm that wished to disclaim warranties and charge monopoly prices. Thus, some warranties will be seen and some firms that disclaim will charge less than h_N .

To summarize, when firms have a comparative advantage at selling with warranties, but not enough consumers shop to sustain a competitive equilibrium, disclaimers are not seen, but supracompetitive prices exist. When the comparative advantage runs the other way, some firms will degrade contract content but probably

not all; again, supracompetitive pricing will occur for products with and without warranties.

When do firms have a comparative advantage at selling with warranties? This advantage obtains when (1) the making of a warranty adds little to a firm's fixed cost ($F'=0$ or is small), and (2) consumers strongly prefer warranties. Respecting the rationale for these conditions, if consumers strongly prefer warranties, the highest price they would be willing to pay for the good with a warranty should significantly exceed the highest price they would be willing to pay for the good without a warranty; hence, a firm offering the good at its highest price would need fewer customers to break even when selling with warranties than when selling without them, unless fixed costs are considerably higher with a warranty. Condition (1) rules this possibility out. This model therefore yields the seemingly sensible result that warranties will be more common when they cost relatively little to make and are strongly preferred, even in environments characterized by considerable imperfect information.

The three possible outcomes just discussed can be characterized mathematically. In addition to the notation used above, let " α_W " be the comparative advantage of selling with warranties, and " α_N " be the comparative advantage of selling without warranties. Then

$$\alpha_W = (F + F') / (h_W - c_W)$$

and

$$\alpha_N = F / (h_N - c).$$

Given these definitions,

- (1) The necessary and sufficient condition for all firms to sell with warranties at competitive prices is

$$a_1 s_W \leq \text{minimum}(a_W, a_N).$$

- (2) The necessary and sufficient condition for all firms to sell with warranties, but with some or all firms charging supracompetitive prices, is

$$a_W \leq \text{minimum}(a_1 s_W, a_N).$$

- (3) The necessary and sufficient condition for some (possibly all) firms to sell without warranties and at supracompetitive prices is

$a_N \leq \text{minimum}(a_W, a_1 s_W)$. Warranties will disappear altogether if

$$(a) \quad a_1 s_W > (a_1 + 2a_2)a_N, \text{ and}$$

$$(b) \quad k_W \leq a_1 F' / (a_1 + 2a_2)a_N$$

where $k_W = (h_W - c_W) - (h_N - c)$.

Respecting the last two conditions in case (3), the first implies that a complete deterioration of warranty content is unlikely if a fair number of consumers shop, for then $a_1 s_W$ will be small relative to $(a_1 + 2a_2)a_N$; the inequality is then less likely to be satisfied. The second condition implies that a complete deterioration of warranty content is unlikely if consumers strongly prefer warranties, for then $h_W - c_W$ should be considerably larger than $h_N - c$. In this event, k_W also will be large, and so the second inequality is less likely to be satisfied.

(b) No Consumers Prefer Warranties

A warranty is an insurance policy that sellers offer against product related losses. In the case considered here, consumers prefer to spend on other things than insurance. Since consumers are perceived often to want at least some protection against defects, especially when purchasing durable goods, another way to conceptualize this second case is to regard consumers as preferring "limited" warranties when firms have the technical capability to offer "full" warranties.³⁰ We next show that in this event firms will never offer full warranties, but may charge supracompetitive prices for limited ones. For convenience, we describe this case as involving consumers who prefer no warranties at all, but the essential result should be kept in mind: firms will never offer more warranty protection than consumers desire.

We make the same assumptions as above respecting consumers and firms, but change the notation slightly. Here " ℓ_W " is the consumer's willingness to pay or limit price for the product with a warranty while " ℓ_N " is the consumer's willingness to pay for the product without a warranty. Because consumers now do not prefer warranties, their preferences can be captured by the expression $\ell_W - \ell_N < p_W^* - p_N^*$; a consumer's marginal willingness to pay for warranty protection is less than the minimum cost firms must incur to sell with warranties. Also, the comparative advantage to firms of selling with warranties is then " β_W ," where $\beta_W = (F + F') / (\ell_W - c_W)$; the comparative advantage to firms of selling without warranties is then " β_N ," where

$$\beta_N = F/(f_N - c).$$

Once more, if enough consumers comparison shop all firms will sell without warranties at the competitive price. The logic is similar to that used above. If all firms sell without warranties at the competitive price, a firm wishing to deviate will sell only to nonshoppers. Should it deviate in the price dimension only, it will charge f_N ; should it deviate in both dimensions, it will make a warranty and charge f_W . Once more, if enough shoppers exist, the losses incurred by losing their business will outweigh the gains from either deviation strategy. Hence, a competitive equilibrium in which no firms offer warranties is sustainable. The necessary and sufficient conditions for this equilibrium to obtain are

$$(i) \quad a_1 \leq \beta_N/s$$

and

$$(ii) \quad a_1 \leq \beta_W/s_W,$$

If too few shoppers exist to sustain a competitive equilibrium, firms would deviate from the competitive outcome only in the price dimension; they would never offer unwanted warranties. To see why, we should look again at the concept of willingness to pay. A consumer's "willingness to pay" for warranty protection may be conceptualized as the difference between the highest price that a consumer would pay for the product with a warranty and the highest price he or she would pay for the product without one. If this difference is less than the marginal cost to firms of offering warranties, no warranty would ever be offered. This is because a firm

could induce a consumer to take a warranty only by offering it at less than marginal cost, and profit maximizing firms will not make such sales.

A consumer's willingness to pay for warranty protection may be written as $f_W - f_N$, and the additional marginal cost necessary to sell with a warranty is $c_W - c$. Hence, no warranties are offered when $f_W - f_N < c_W - c$. This condition does not necessarily hold under the relatively restrictive assumption we make respecting firms' cost functions, that firms have constant marginal costs, and so sell up to a capacity constraint in competitive equilibrium. This assumption is made for analytical tractability; were we to relax it, such that firms had more "normal" cost curves, it would turn out that $c_W = p_W^*$ and $c = p_N^*$; price equals marginal cost. Then, under this natural condition, that $f_W - f_N < p_W^* - p_N^*$ would imply that $f_W - f_N < c_W - c$. Hence, we assume this latter inequality to hold. When it does, consumers who dislike warranties would never be willing to pay for warranty protection; thus, no warranties would ever be observed. If an insufficient number of shoppers exist to sustain a competitive equilibrium, firms will increase prices. This occurs when $a_1 > \beta_N/s$.³¹

C. Preliminary Normative Implications

Firms commonly are said to respond to the existence of "imperfect information" by supplying less warranty coverage than consumers want. We have shown, in contrast, that consumers are likely in many cases to get just that warranty coverage that they desire.

Also, not every consumer must shop for warranties to make warranty markets responsive to consumer preferences. These results are significant for three reasons. First, because we have assumed that consumers can make correct choices--they know failure probabilities perfectly--the competitive equilibria that actually occur are efficient. Second, noncompetitive equilibria take a different form than is commonly supposed. Firms are thought to degrade coverage in these equilibria, but they are more likely to offer the correct coverage at supracompetitive prices. This has obvious policy implications that we pursue below.³² Third, consumers in our model will purchase warranties only if they believe warranty protection to be worthwhile; that is, only if warranties are offered for sale at or below the consumers' limit prices. Persons in general seem better off if they can get what they want, though they sometimes may have to pay too much for it, than they would be if their desires were frustrated altogether.

Finally, our model is suggestive respecting the question whether imperfect information causes a warranty market to behave noncompetitively. Economic models often are hard to apply directly to real world problems because it is difficult to gather the data on which their application depends. For example, explicit warranty prices seldom are observable because firms commonly sell a joint product for a single price--the item with a warranty. Also, the necessary and sufficient conditions for the various equilibria we set out above include terms referring to firms' marginal costs (c_W and c);

marginal cost data is notoriously hard to get. Hence, a model such as ours is useful for policy purposes only if it tells a story that is more plausible than competing but equally difficult to test explanations. The model also may assist in the evaluation of actual market outcomes if, in addition, it suggests factors that correlate with normatively relevant states of the world and if decisionmakers can observe such factors relatively conveniently. Our model satisfies all of these criteria fairly well.

Initially, the model rests on two plausible intuitions about firms and consumers. The first is that firms will satisfy consumer preferences when doing so would increase profits. If enough consumers will withdraw business from firms that ignore their interests, satisfying those interests then becomes the profit maximizing strategy. Hence, normatively desirable equilibria in our model correlate positively with the extent of comparison shopping in which consumers engage. The second intuition is that consumers will get what they want if they are willing to pay for it. In particular, if consumers strongly prefer warranties, firms are unlikely to have a comparative advantage at selling without warranties; consequently, the probable response of firms to imperfect information will be to raise prices rather than deteriorate warranty content. Thus, normatively desirable equilibria in our model also correlate positively with consumers' willingness to pay. The factors of comparison shopping and willingness to pay generate a story about warranty markets that seems more plausible than the competing explanations criticized in Part IIA

above. These two factors also will sometimes be of use to decisionmakers in evaluating actual markets.

Before showing how these factors can be used in this fashion we note a particular fact about consumer warranties, their homogeneity. Almost identical warranty coverage seemingly exists within and sometimes across product lines. For many "hard" goods, as an example, there is a standard warranty, that (i) disclaims implied warranties of merchantability and fitness; (ii) makes an express warranty against defects in materials and workmanship, (iii) limits the consumers' recovery under this warranty to the repair or replacement of defective product parts; (iv) limits the time within which claims can be brought under the express warranty; and (v) when personal injury or serious property damage is possible, excludes recovery for consequential damages.³³ Deviations from this pattern, broadly speaking, are of two major types. Some firms will reduce coverage, as by limiting coverage to the original purchaser or excluding it for specified uses, such as racing a passenger vehicle. Also, some firms will expand coverage, primarily by lengthening the standard term within which claims can be brought. Because of the very small sample sizes in existing research of actual warranties and because researchers often compare warranties across industries rather than within particular product lines, it is impossible to know how frequently these deviations from the standard warranty actually occur. Consequently, we shall briefly consider three hypothetical but possible cases in light of the analysis above.

(1) All firms selling a similar product line offer the same warranty, which provides less than full protection against product related harms. Our model shows that consumers will get no more coverage than they want but may get less; hence, complete homogeneity at less than the full protection level could reflect all firms offering the coverage that consumers prefer or all firms deteriorating warranty content in identical fashion. Two factors that a decisionmaker could use to ascertain which possibility is most likely are the extent of comparison shopping and the consumers' willingness to pay for warranty protection. A numerical example will illustrate the relevance of these measures.

When consumers prefer a given level of warranty protection, all firms in a market will offer less protection than this if and only if all of three conditions are satisfied:

$$(1) \alpha_N \leq \min\{\alpha_W, a_1 s_W\};$$

$$(2) a_1 s_W > (a_1 + 2a_2)\alpha_N;$$

$$(3) k_W \leq a_1 F' / (a_1 + 2a_2)\alpha_N,$$

where $k_W = (h_W - c_N) - (h_W - c)$. Let

$$F = \$1,000$$

$$F' = \$200 \text{ (for a fuller warranty)}$$

$$s_W = 100 \text{ units}$$

$$c = \$45$$

$$c_W = \$46 \text{ (for a fuller warranty)}^{34}$$

$$h_W = \$62 \text{ (for a fuller warranty)}$$

$$h_N = \$59$$

$a_1 = .80$ (80% of the consumers are nonshoppers).

Respecting the three conditions listed above, the first is satisfied, for $\alpha_N = 71$; $\alpha_W = 75$; $a_1 s_W = 80$, and thus $\alpha_N \leq \min(\alpha_W, a_1 s_W)$. Because firms have a comparative advantage at selling without warranties, some of them could deteriorate warranty coverage in response to a lack of comparison shopping. For all firms to act in this way, the last two conditions must also be satisfied. Condition two is not. While $a_1 s_W = 80$, $(a_1 + 2a_2)\alpha_N = 85$; the left side of the inequality is less than the right side. Hence, the observed homogeneity could not reflect a complete deterioration of warranty coverage. In addition, since at least some firms in this illustration would reduce warranty coverage in response to insufficient comparison shopping, that no firms have done so implies the occurrence of enough comparison shopping to sustain a competitive equilibrium. Also, we have defined a consumer's willingness to pay for a warranty as the difference between the highest prices the consumer would be willing to pay for the good with and without warranty protection. In the illustration, this difference is \$3. Let the willingness to pay for a warranty rise to \$4.50. Then the respective comparative advantages are reversed; α_N remains at 71 while α_W declines to 68. In this event, firms would never respond to imperfect information by reducing coverage. Thus, although the figures themselves are imaginary, they do suggest that if a moderate amount of comparison shopping occurs (20 percent in the example) and if consumers strongly prefer warranties, an outcome in which all firms

offer the same coverage is unlikely to reflect the complete monopoly equilibrium.³⁵

(2) Most firms in a market offer the same warranty, but a very few offer extended coverage on important components. Since consumers will not get more warranty coverage than they want, this pattern could reflect (a) "Noise": The deviant firms are making promotional warranties, for example; (b) Unsuspected heterogeneity in products or consumer preferences. A decisionmaker evaluating coverage must make an initial, largely impressionistic judgment as to what products are in the same market.³⁶ Diverse warranty coverage could indicate previously unnoticed differences in product types or consumer wants; (c) All but a few firms are deviating downward from the preferred coverage in response to a lack of comparison shopping.

These possibilities suggest the factors that a decisionmaker could explore. Promotional warranties are easy to identify since they commonly are associated with the introduction of new products. Respecting a choice between the last two outcomes, the question is whether consumers actually are shoppers for the products that have and lack the better warranty. Suppose that consumers who purchase the standard warranty would not purchase the better one, though they have the opportunity to do so, because they believe the additional protection not to be worth its cost to them. Then, two markets actually exist, one for a product with the standard warranty and the other for a product with the better warranty; coverage in each market is homogeneous and can be evaluated as above. But if consumers would

pay the premium requisite for greater warranty protection, so that one market in fact exists, market performance is unsatisfactory. Many firms are offering less preferred coverage at supracompetitive prices.

(3) Most firms in a market offer the same warranty, but a very few restrict coverage, as by limiting it to the original purchaser. This pattern could reflect (a) Unsuspected heterogeneity. Consumers who purchase the restricted warranty would not pay the premium requisite to obtaining the standard warranty, or (b) One market exists and a few firms in it are deteriorating warranty content. In this event, prices for the standard warranty also are likely to be too high, for insufficient comparison shopping occurs to sustain the competitive equilibrium. If inquiry rules out heterogeneity, a decisionmaker could know that while coverage is not a serious problem--only a few firms deviate--pricing could be. An analysis of actual pricing patterns would then illuminate the problem's seriousness.

Two general remarks should be made about this exercise. First, the factors that we suggest are relevant will seldom be susceptible of precise application. They rely heavily on survey data--how much shopping occurs? Would consumers pay for broader warranties? Such data is expensive to gather, and sometimes will suffer from response bias. As an illustration, a consumer might say in an interview that he would be willing to pay a large sum for a warranty because he wants to portray himself as a prudent person, while in fact he would buy without a warranty if given the choice.

Consumer surveys nevertheless may yield useful data, and are employed in other legal fields for similar purposes as those suggested here. In antitrust, as an illustration, consumer attitudes toward possible price movements are used to determine whether different products actually are in the same market for the purpose of evaluating the competitive effect of mergers. Also, decisionmakers today evaluate the effect of imperfect information on contract quality innocent both of theory and data. Suggestive data whose relevance is implied by plausible theory should make possible more sensible policy.

Second, both the relatively happy normative outcomes that the model predicts--consumers often will get the warranties they want; all competitive equilibria are efficient--and the positive analysis itself depend heavily on the model's assumptions. For example, if consumers will make incorrect choices respecting warranty coverage because they are uninformed about risks, that markets by and large respond adequately to those choices may not be especially desirable. The model's assumptions thus must be examined in more detail, but before doing so, we shall set out a model for a security interest market. This model is similar to the ones just discussed, and will complete the formal analysis of markets for contract terms.

III. Security Interest Markets

Security interests in consumer goods have been extensively regulated. Since the central concern is overbroad security, the relevant question is whether firms exploit the existence of either aspect of imperfect information by exacting more draconian security

interests than well informed consumers would grant. As before, we initially suppose that consumers can make correct choices respecting security, and then set forth a model of a "security interest market" in which consumers are imperfectly informed of market prices and terms.³⁷ This model shows that firms will not respond to insufficient consumer search by exacting overbroad security interests, but may charge supracompetitive interest rates for those security terms that consumers prefer. Hence, regulation restricting security on imperfect information grounds is misconceived if consumer choices for and against security are correct, a question we take up in Part IV, infra.

We initially suppose: (i) Creditors are banks, each of which makes loans for a fixed amount, " L "; (ii) The probability that a consumer will default is " π ", which is known to all; (iii) consumers who default may go bankrupt; the probability that a consumer will go bankrupt given that he or she has defaulted is " λ "; (iv) Firms recover a fraction of the unpaid debt, " p ", in bankruptcy proceedings; (v) A firm can lend with or without a security interest, but cannot do both. Security interests in this model are purchase money; the bank provides credit to enable the consumer to purchase the product.³⁸ If a firm takes security, it can recover the value of the used good, " V ," whether the consumer goes bankrupt or not.³⁹ We assume that the collateral on repossession is worth less than the outstanding debt; $L > V$; (vi) " r " is the interest rate, " S " is the total amount of funds available for loans, and $S/L = s$ is then the firm's capacity, the total number of loans that can be made; (vii) " F " is the firm's fixed cost

in making loans, and " c " is its marginal cost. This cost is measured as an interest rate--the opportunity cost of not lending in nonconsumer markets. Let " c_S " be the marginal cost of lending with security and " c_N " the marginal cost of lending unsecured. If a firm does take security, its fixed costs increase in an amount " F' ", where F' includes the cost of drafting security agreements, administering a resale facility for repossessed collateral and so forth.

These assumptions imply that a firm's expected net marginal rate of loss due to bankruptcy is $\pi\lambda(1-p) \equiv k$. If a firm recovers a fraction of the unpaid debt, p , in bankruptcy proceedings, it loses the fraction $(1-p)$ when the consumer becomes bankrupt. The probability of default is π , and of bankruptcy given default is λ ; hence, the total expected rate of loss from bankruptcy is the product of these factors, $\pi\lambda(1-p)$, which we denote by k . If the firm takes a security interest, it can recover the value of the used good, V . Since otherwise it might have to seek this value in bankruptcy, and its rate of loss on the sum would then be k , the value of security to the firm is Vk ; security saves the firm this sum. The additional cost of taking security per loan is F'/s , where F' is the increased cost of security and s is the number of loans. We assume $F'/s < Vk$, which is to say that the cost of security to a firm (F'/s) is less than the gain (Vk). If r_N^* is the competitive interest rate on a loan without security and r_S^* is the rate with security, it then follows that $r_N^* > r_S^*$; interest rates are lower when firms take security because in competitive equilibrium price equals cost and security lowers a firm's

costs.

Respecting consumers, we assume that (i) each consumer wants to borrow L dollars or none; (ii) consumers shop exactly as they do for warranties. In particular, consumers set fixed sample sizes before searching for loans, with some consumers' sample sizes equaling one (the nonshoppers) and some consumers' sample sizes exceeding one (the shoppers); (iii) h_N is the limit price (or interest rate) that a consumer will pay when no security interest is taken and h_S is the limit price when security exists. Here $h_N > h_S$; consumers are willing to pay higher interest rates when no security is demanded; (iv) Consumers prefer not to give security. This is to say that a consumer offered the opportunity to borrow at competitive interest rates with and without security will pay the premium necessary to compensate firms for lending unsecured. For convenience, consumers are said here not to prefer security at all; the analysis also applies when consumers prefer less security than firms would like to obtain.

The only single price equilibrium in this model occurs when no firm demands security and all firms charge the competitive interest rate r_N^* . The logic underlying this result is similar to that used above. First, let the competitive outcome obtain. A firm wishing to raise its price above r_N^* but lend without security will lose the business of every shopper. This is because each shopper will see at least one price-- r_N^* --that is less than the price of the deviant firm. Hence, the deviant will lend only to nonshoppers and would charge them h_N , the highest rate for a loan without security that consumers will

pay. If too few nonshoppers exist, the firm would do better by staying at r_N^* than by going to h_N . A firm wishing to deviate from the competitive outcome by demanding security also would lend only to nonshoppers. The shoppers by assumption prefer to borrow unsecured at r_N^* rather than borrow secured at the lowest price possible for security, r_S^* . Hence, this deviant firm also would lend only to nonshoppers, and thus would both exact security and raise its price to h_S , the highest interest rate consumers are willing to pay for secured loans. Once more, if too few nonshoppers exist, this strategy would be less profitable than the strategy of continuing to lend unsecured at r_N^* . Therefore, if enough comparison shopping occurs, the only single price equilibrium will be at the competitive price, without security.

If too few shoppers exist to sustain a competitive equilibrium, firms will charge supracompetitive interest rates but would not demand security. To see why, recall that a firm's marginal cost for lending with security is c_S , and for lending unsecured is c_N . Firms would not forego security unless consumers would be willing to pay them the cost of giving it up. This cost is $c_N - c_S$ and the consumers' willingness to pay to avoid security is $h_N - h_S$. Hence, security will not be seen if $h_N - h_S > c_N - c_S$. Again, though this inequality does not necessarily hold given the restrictive constant marginal cost assumption we make, we assume it to hold, for it would be the case that $c_N = r_N^*$ and $c_S = r_S^*$ were firms assumed to have more normal cost curves. Therefore, if consumers do not want security but

too few of them shop to generate a competitive equilibrium, firms will charge supracompetitive prices but will not exact unwanted security interests.

Consumers may prefer security if V_k , the savings that security makes possible to a firm, is large. In this event, security could reduce a firm's cost sufficiently so that $h_N - h_S < r_N^* - r_S^*$; consumers' willingness to pay ($h_N - h_S$) is too slight to overcome the large premium that firms would charge to eschew security ($r_N^* - r_S^*$). Supposing consumers now to want the interest rate reductions that security makes possible, the analysis is then similar to that made respecting warranties. In this event, (1) all firms will lend with security at r_S^* if enough consumers comparison shop; (2) all firms will lend with security but some or all will charge supracompetitive prices if (a) not enough shopping occurs to sustain a competitive equilibrium and (b) firms have a comparative advantage at selling with security, and (3) firms will both charge supracompetitive prices and eschew security if the comparative advantage is the other way and insufficient shopping occurs. Firms will have a comparative advantage at lending with security if the fixed cost of security (F') is low and the consumers' desire for the lower interest rates that accompany it--the willingness (not) to pay--is high. Hence, consumers who prefer to borrow with security will be able to do so if their preference is sufficiently strong and security is not excessively costly for firms to take, even if little shopping for credit occurs.

This analysis implies that current regulation of security

interests in consumer goods is misconceived, to the extent that it is made to rest on the notion that consumers are imperfectly informed about the possibilities respecting security that the market offers. Regulation today is devoted almost exclusively to restricting the ability of firms to take security. But firms will not demand more security than consumers prefer to give, though they may exact less. Also, those competitive equilibria that exist in markets for security interests are efficient, supposing consumers to be able to make correct choices respecting security. Thus, the principal problem in markets for security seemingly is that interest rates may be too high. This problem, however, has already been addressed by legislation such as the Truth in Lending Law, apparently successfully.⁴⁰

Again, though, the positive and normative implications of this analysis are sensitive to its assumptions. For example, we suppose that consumers can make correct choices respecting security but have given no grounds in support of this assumption. We thus turn to an analysis of the important but seemingly controversial assumptions that underlie the models just described.

IV. Underlying Assumptions

Economic models commonly make assumptions for heuristic purposes that may be false in fact. These assumptions often are innocuous. For example, our models assume that consumers have peculiar demand functions--they always buy one unit or none--and that firms have peculiar cost structures--they have constant marginal costs so that average costs continuously decline until the level of output

is reached at which they are minimized, after which costs become infinite. The models' results do not change when these strong assumptions are relaxed.⁴¹ Also, the models assume that consumers have common limit prices and use fixed sample size search strategies. The former assumption is false and the latter is a plausible surmise, yet the predictions of our homogeneous goods model, which used these assumptions, are consistent with actual market behavior.⁴² We shall discuss here two of the later models' assumptions that may seem particularly problematic: (1) consumers can value the risks that contract terms allocate--they know the "odds", and (2) consumers cannot affect the odds, an assumption which, among other things, allows us conveniently to suppose that consumer preferences for warranty and security interest terms are homogeneous. The models' results must be qualified in light of a more realistic appraisal of these assumptions, but the qualifications seem less serious than may be thought.

A. Imperfect Information in the First Sense: Knowing the Odds

The typical person's estimates of the odds of product failure or of his or her own default seldom will equal the true values. Firms are believed to exploit these errors by imposing unwanted terms. Firms, however, respond to consumers in the aggregate, not as individuals; consequently, no firm knows or could know the estimate of the odds that any particular consumer holds.⁴³ Hence, the question is whether consumers in the aggregate make systematic errors such that firms have incentives to degrade contract content. We next argue that

systematic error of this sort is uncommon.

(1) Market Responses to Consumer Errors

Markets will correct for some forms of consumer error. To show how this occurs, we shall begin with products and make the more realistic assumption that a consumer's subjective probability of product failure is related to but is not exclusively determined by actual failure probabilities. Let "S" be the consumer's subjective belief of the likelihood of product failure; "A" be the actual odds and "e" be an error term reflecting the existence of imperfect information. Then $E(S) = E(A) + E(e)$, where "E" is used to denote the expected odds, and errors are assumed to be additive. If a consumer is "optimistic", believing the product to be more reliable than it is in fact, e is on average negative; $E(S) < E(A)$; if the consumer is "pessimistic," believing the product to be less reliable than it actually is, e is on average positive $E(S) > E(A)$. For the unbiased consumer, e is zero; $E(S) = E(A)$. This representation of consumer preferences seems plausible for two reasons. First, a consumer's subjective belief about product reliability probably is related to actual reliability. A new car or stereo, for example, is unlikely to be radically more or less reliable than prior models. A consumer often will have owned a prior model or talked with others who have owned it or who own the new model. Also, the characteristics of many new models are discussed in magazines and newspapers. Hence, the actual odds are likely to influence the consumer's estimate of what those odds are. Second, because consumers lack the expertise and

resources to test products, and because some product characteristics can only be revealed through use, a consumer's estimate of the actual odds will seldom be completely accurate. Thus it is realistic to represent this estimate as $E(S) = E(A) + E(e)$, where the error term e is generally positive or negative.

Three possibilities exist respecting the error term when it is viewed as an aggregate phenomenon. First, S fluctuates randomly around the true value A ; e is "unbiased." An error term is unbiased when positive and negative estimates of the true value cancel out. Then, for consumers in the aggregate the mean estimate $\overline{E(S)}$ equals the true value $E(A)$. Since consumers in our models shop randomly across firms, each firm will probably see a representative sample of the market. Therefore, each firm will respond as if the consumers visiting it knew the odds perfectly; that is to say, the firm will satisfy the correct consumer choices provided that the conditions derived above for satisfying any choices at all are met. Hence, if consumer estimates of the odds of product defects, or any other odds, fluctuate randomly around true values, that imperfect information in the first sense exists does not create a policy problem.

Markets also correct for most manifestations of pessimism. To see how, consider two cases. In the first, consumers would want a warranty if they knew the actual odds, and also are pessimistic. In this case, pessimism is reflected in the limit price, h_W , which is higher than it would be were the true odds known; pessimistic consumers of this sort are willing to pay excessive prices for

warranties. Such pessimism creates no policy problems independent of those that occur from insufficient comparison shopping itself. Initially, since the consumers at issue would prefer a warranty were they informed, one possible problem is that firms might respond to insufficient shopping with disclaimers. This outcome, though, is less likely to occur when consumers are pessimistic than when they are informed; for when h_W increases relative to h_N , the limit price for the product without a warranty, firms are more likely to have a comparative advantage at selling with warranties. Hence, when informed consumers would want warranties and actual consumers also are pessimistic, firms are less likely to respond to insufficient shopping by degrading coverage than when consumers are perfectly informed respecting risks. Because h_W is higher when pessimism exists, a second conceivable problem is that firms may charge pessimistic consumers higher prices for warranties than well informed consumers would pay. Comparison shopping prevents this outcome. Suppose that all firms offered a warranty at the limit price, h_W , which pessimism causes to be artificially high. This price cannot constitute an equilibrium because firms have an incentive to undercut it. A firm can costlessly reduce its price below h_W since its warranty expenses are a function of the actual odds, not the odds that consumers believe to exist. If the firm did cut its price by a small amount, it would continue to sell to the nonshoppers and also sell to every shopper who visited it, for it would have the lowest price in the market. The firm could thereby increase profits over those earned by charging h_W ,

even when a small amount of shopping occurs. Hence, h_W could not be an equilibrium price. And by the logic of the warranty model set out above, no other price could constitute an equilibrium except the competitive price, which equals each firm's minimum average cost. This latter price reflects the actual odds of product failure. Thus comparison shopping can ensure that consumers pay correct prices for warranty coverage, despite pessimism.

To summarize, when consumers who know the odds would prefer a warranty and actual consumers also are pessimistic, no independent policy problem exists because (i) if insufficient comparison shopping occurs to sustain a competitive equilibrium, pessimistic consumers are more likely to get warranties than perfectly informed consumers are, and (ii) even modest amounts of comparison shopping will prevent firms from exploiting the greater willingness to pay of pessimistic consumers by charging artificially high prices for warranty protection. If pessimistic consumers do not shop sufficiently to sustain a competitive equilibrium, a problem of course exists, to which the best state response is to facilitate comparison shopping. But this also is the best response when well informed consumers engage in too little shopping. Hence, pessimism presents no independent policy problem in this first case.

A concern may exist in the second case when well informed consumers would not prefer a warranty, but pessimism respecting the odds of failure causes actual consumers to want one. Comparison shopping would cause the resultant warranty prices to be well behaved,

but consumers would be purchasing excessive coverage. This problem does not seem serious for two reasons. First, pessimism may be unstable because firms have an incentive to dissipate it. Pessimistic consumers not only prefer unnecessary warranties when they buy, but also will buy less than they would were they well informed. Hence, firms should make efforts to prevent or reduce systematic pessimism. Second, pessimism at worst causes consumers to be overinsured. Consumers are commonly thought to be much worse off if they are without protection against product related losses than if they sometimes have too much protection.⁴⁴

A similar analysis applies to consumer choices for and against security. If consumer estimates of the odds of default are unbiased, firms will respond as if consumers held correct estimates. Respecting pessimism, suppose first that consumers would reject security were they well informed and actual consumers also believe default to be more likely than it is in fact. These consumers will be willing to pay more than they should to avoid security interests. Comparison shopping, however, will prevent firms from exploiting this greater willingness to pay by charging excessive interest rates. Suppose next that well informed consumers would prefer security but pessimism respecting the odds of default causes actual consumers to reject it. Then, while comparison shopping would cause interest rates for unsecured loans to be competitive, consumers are borrowing under the wrong contract. This problem is not serious. Firms have an incentive to dissipate pessimism because pessimistic consumers not only will

reject security; some of them also will not borrow or will borrow less. Hence, systematic pessimism may be unstable. Also, the perceived policy problem in this area is that security puts consumers too much at the mercy of firms; pessimism at worst causes consumers to be less at the mercy of firms than in the full information case.

The third possibility respecting the odds is that consumers are optimistic. In this event, a policy problem exists because markets may correct poorly for optimism. As regards warranties, suppose first that consumers would want a warranty if they knew the odds and actual consumers also are optimistic. In this case, optimism is reflected in the limit price, h_W , which is lower than it would be were the true odds known; optimistic consumers have an artificially low willingness to pay for warranties. If insufficient comparison shopping occurs to sustain a competitive equilibrium, firms are more likely to degrade contract quality than in the full information case. This is because when h_W falls relative to h_N , firms are more likely to have a comparative advantage at selling without warranties. Hence, when well informed consumers would want warranties and actual consumers are optimistic, insufficient comparison shopping is likely to yield both supracompetitive prices and suboptimal coverage. This problem can be cured, at least in theory, by facilitating comparison shopping, but optimism causes a second problem that is less easily treated.

If well informed consumers would want warranties but optimism causes actual consumers not to demand them, warranties probably will

not appear. Firms seemingly lack an incentive to offer broader warranties than consumers demand because such warranties are costly--a firm would have to redeem its warranty promise. Optimistic consumers might resist the price increases necessary to cover this cost. On the other hand, optimistic consumers who purchase too narrow warranties will often be disappointed; they will experience significant uninsured losses. Firms consequently will lose good will. Hence, firms seemingly are better off if consumers would make correct choices, for then firms can preserve good will by making appropriate warranties, yet recover the full costs that these warranties create. Curing consumer optimism, however, could be difficult. Firms would be reluctant to conduct advertising campaigns whose theme is "Our widgets break a lot." A more promising response is to make correct warranties but bury the cost in the total price of the product. How often this is done is not known. Also, at least some firms might maximize profits by exploiting consumer optimism in the short run. Thus, systematic consumer optimism respecting product failure rates creates a policy problem, but its seriousness is unknown.

If consumers believe default to be less likely than it is in fact, they will not resist demands for security interests strongly enough, for they may think that foreclosure will seldom occur. We showed above that firms will not demand security when consumers are willing to pay to avoid it. This occurs if $h_N - h_S > c_N - c_S$. Optimistic consumers may set h_N too low or h_S too high; in either event, the difference between h_N and h_S will be smaller than it

should, which increases the likelihood that this difference will not exceed the marginal cost to firms of doing without security. Hence, if consumers are optimistic regarding the odds of default, they seemingly will make too many secured loans. On the other hand, security gives firms advantages in compelling payment. Optimistic consumers who then default will come to believe that these advantages are too great or too frequently employed--that firms act "unfairly." This also will cause good will losses, that it may be in the interest of firms to avoid. Firms could easily do this by demanding security only when the actual odds justify it. Again, how often they so act is unknown. Hence, consumer optimism respecting the odds of default also seems to be a policy problem of uncertain seriousness.

To summarize, aggregate consumer estimates of the odds will be unbiased, systematically pessimistic or systematically optimistic. The former two possibilities do not create serious policy problems independent of those caused by insufficient consumer shopping for favorable terms itself, but the latter might. Thus, we next ask whether reasons exist to believe that consumers are systematically optimistic respecting the consequences of commercial choice.

(2) Consumer Optimism: The Nature of the Problem

Whether consumers are systematically optimistic respecting the odds that products will fail or that they themselves will default on loans is unknown. Also, rigorous tests of an optimism hypothesis seem difficult to conduct. Thus, it is necessary to ask which assumption in regard to optimism decisionmakers should hold, pending the

gathering of data. We shall initially consider this question for products, and then discuss default.

Imperfect information respecting product quality is primarily a problem for infrequently purchased items. Consumers buy toothpaste, milk and razor blades often enough to know how reliably they perform. Also, the law is concerned with expensive mistakes. Hence, the question is whether consumers believe that such items as cars, stereos and refrigerators perform better than they do in fact. There are two ways in which such optimism could exist. First, markets may provide insufficient data on which reliability can be gauged, and persons may respond to uncertainty with optimism. Second, the data exist but persons may erroneously make more optimistic predictions than the data permit. We shall discuss the first possibility here and the second in Part IV A (3), infra.

Insufficient data is commonly thought to exist because when consumers purchase infrequently, they cannot rely on their own experience; new washers are different from ten year old washers. But consumers can search for information about new washers. Therefore, insufficient data might exist because consumers do not search for them or because no one has an incentive to provide them. Neither possibility seems plausible. Both economic and psychological analysis suggest that persons will attempt to acquire more information about expensive products than about cheap ones, largely because people want to avoid risk, and risk generally increases with product price. Respecting an economic analysis, suppose: (i) Persons dislike the risk

associated with uncertainty and will incur costs to reduce it; (ii) Uncertainty concerning product reliability can be represented as a range of odds of a breakdown, as: "The probability that this product will fail is between .1 and .3"; (iii) The "odds range" doesn't shrink as products become more expensive, which is only to say that expensive goods are at least as difficult to evaluate as cheap ones; (iv) There are economies of scale to search. (v) Consumers believe that they can reduce uncertainty by acquiring more information about products. These assumptions imply that persons will search relatively more for reliability data when they buy expensive items. To see why, assume that a product costs \$100 and becomes useless when it breaks; a consumer believes the chance of a breakdown is between .1 and .3; and increased search could reduce this range to between .1 and .15. Without search, the expected value of a loss ranges from \$30 to \$10. Search could reduce the range by \$15, to between \$10 and \$15. Now let the product cost \$1,000. By assumptions (i) and (v), consumers will be motivated to search in both cases to reduce the range; by assumption (iii), the expected value of a loss in the second case has a range of \$200, and can be reduced by \$150 by search, which creates a significant incentive for consumers to search; and by assumption (iv), search itself is more fruitful in this second case since the more expensive is the product, the greater is the return per dollar invested in search in reducing uncertainty about possible losses. Hence, consumers should attempt to find out relatively more about product reliability when they buy expensive items.

Respecting these assumptions, that expensive products by and large are as difficult to assess as cheap ones seems unexceptionable. The assumption that persons will incur costs to reduce uncertainty is consistent with the penchant of people to buy insurance, which substitutes certain for uncertain outcomes, and by behavior in financial markets, where investors frequently pay to reduce the variance in expected returns. Finally, economies of scale to search about reliability probably exist because a significant portion of these search costs are fixed. For example, a consumer who wants to discover reliability data for electric can openers and cars could in both cases go to the public library and read ratings in consumer magazines. The cost of both searches is close to identical, but the dollar reduction in the range of possible losses is much greater for cars because they cost much more; dollars invested in searching for cars thus bring relatively greater returns than dollars spent in searching for can openers. Therefore, greater search should occur for just those products where the assumption that consumers know the odds seems most questionable.

Psychologists have developed the concept of "perceived risk." According to this concept, consumers experience subjective risk when they purchase. This risk is a function of uncertainty--"will I be satisfied with the purchase?"--and consequences--"will a purchase error cost me money, physical harm, a loss of social status?" The size of the perceived risk varies directly with the degree of uncertainty and the gravity of the possible bad consequences. Also,

people are supposed to dislike risk and be motivated to reduce it.⁴⁵ This can be done by reducing uncertainty--by acquiring more information about the purchase--or by reducing the possible bad consequences. The former alternative should be chosen more frequently. For example, rich people may be worried about the risk of purchasing expensive cars, but not many will choose to reduce risk by buying subcompacts; rather, they will acquire information about the expensive cars in their choice sets. Hence, the psychological model also predicts more search as products become more expensive.

The little evidence that exists is consistent with the predictions of both models; people attempt to acquire more information about expensive goods than about cheap ones.⁴⁶ Thus, there will be insufficient information on which people can assess the odds only if firms have insufficient incentives to respond to consumer requests. Because information about product reliability has public goods aspects, it is difficult to say that firms will produce the optimal amount of it. Nevertheless, impressionistic evidence suggests that there is much data about expensive, infrequently purchased consumer goods. There are several independent rating magazines, and many supposedly disinterested publications rate automotive and electronic equipment. Also, consumers can learn much about products by using them, so word of mouth seems a useful information source. Studies suggest that consumers frequently use it. Data sets of course will sometimes be incomplete, particularly as regards novel products, but theory and evidence suggest that the case for systematic consumer

optimism respecting product reliability must rest more on some inability of consumers to process data than on the absence of data to process.

A small but significant exception to this conclusion may exist. Suppose an inexpensive, frequently purchased product that in rare cases malfunctions in such a way that serious personal harm ensues. The soda pop bottle that explodes is an example. The property of exploding is not an "experience" quality in the sense that it is revealed by use; rather, explosions just happen. Also, explosions occur so infrequently that consumers may act as if they never occur; that is, consumers act optimistically. Because the product is inexpensive, consumers will not search for much information about it, so the erroneous belief that causes this action would not be dissipated by information accidentally revealed in the course of a general product evaluation. On the other hand, if consumers are aware that products such as soda bottles can malfunction in dangerous ways, it is a separate question whether they understate the risk of this harm. We take up this question in Part IVA(3), *infra*.

An argument that consumers are systematically optimistic respecting the odds of default also must rest largely on consumers' information processing capabilities. The three major causes of default on personal obligations are poor financial planning, ill health and job loss. Respecting the first, firms do better lending to people likely to repay than they do lending to people likely to default and then repossessing their goods. Hence, firms have

incentives to refuse credit to optimists. Two ways for consumers systematically to incur obligations that their financial circumstances should preclude then exist. First, firms routinely lend to unjustified risks; that is, firms routinely make profit reducing loans. Occasional mistakes of this sort occur, but there is no reason to think that they are made systematically. Second, consumers have more information about their repayment prospects than firms do; this information implies a higher likelihood of default than the information available to firms does; and consumers systematically process this data in such fashion as actually to overstate the likelihood of repayment. In sum, if consumers do draw excessively favorable inferences as to repayment prospects from their own financial circumstances as these exist when loans are sought this seemingly is because consumers have more data about these circumstances than firms do but misprocess it.

Respecting the last two causes of default, consumers have more information respecting their own health prospects than firms do. Also, the case as to job loss is ambiguous. A bank may know more about the prospects of the auto industry than a potential worker debtor does, but the worker may know more about his ability to avoid layoffs than the bank does. Hence, consumers could mistakenly believe that ill health or job loss is less likely to cause default than these will in fact largely because they misprocess information, not because they have smaller data bases on which to make inferences than their creditors have.

(3) Cognitive Errors and Optimism

No general theory of how people make inferential judgments exists. In recent years, however, psychologists have developed a great deal of evidence both from laboratory experiments and from life as to how these judgments are made. The central theme of this research is that people make serious, systematic and predictable cognitive errors.⁴⁷ Will these errors cause people to misprocess information such that, in the aggregate, they will understate the odds of defects or defaults? This section argues that the principal cognitive errors that seemingly plague human inference in most cases are either: (i) irrelevant to the question whether people generally are optimistic or pessimistic respecting the odds; or (ii) will cause people to make random errors; or (iii) in the case of products, may incline people toward pessimism.

(a) The Odds of Product Defects

Four sources of cognitive error could affect people's assessment of the odds of product defects, cognitive dissonance, misuse of the "availability" and "representativeness" heuristics and a possible tendency to ignore very low probability events. The cognitive dissonance idea is derived from the theory of cognitive consistency. According to this theory, persons resist holding in awareness two conflicting ideas simultaneously. Thus, they tend to ignore or distort evidence relevant to the truth of one of these ideas.⁴⁸ For example, people are said to believe that they are intelligent and prudent, and consequently will make intelligent and

prudent choices; hence, the theory predicts that people will devalue evidence that impeaches their choices after these choices have been made. A fair amount of evidence supports the theory. As illustrations, workers taking jobs in unsafe occupations apparently come to believe that the industries are safe--smart, careful people would not work in dangerous places. Similarly, some buyers may have more affirmative attitudes towards products after purchase than before.⁴⁹

Cognitive dissonance seemingly could not cause persons to ignore unfavorable information in the case that concerns us, when they are deciding whether to buy. Consumer purchases of major items are discrete events that have high salience; people view them as beginnings--"my new car." Dissonance is unlikely to occur when people consciously gather evidence in order to decide.

The "availability heuristic" can cause persons to make mistakes about the frequency with which events occur. One making inferential judgments by use of this heuristic tends to ignore statistical data in favor of evidence that seems germane and is in awareness--is available. For example, a person may understate the correlation between cigarette smoking and lung cancer because his judgment of this correlation was excessively influenced by his knowledge of two neighbors, each of whom smoked for fifty years and died of stroke. The availability heuristic misleads when the association between cause and effect that is in awareness or is easily summoned up correlates poorly with the frequency with which possible

causes and effects actually covary, as in the cigarette example. Psychologists believe that such mistakes occur frequently because the existence of evidence in awareness is in considerable part a function of its "vividness"--its emotional interest, ability to evoke imagery, concreteness and spatial and temporal proximity.⁵⁰ Vivid evidence is not necessarily the most probative evidence.

If people actually assess product reliability with the availability heuristic, their error term, when viewed in the aggregate, seemingly should be unbiased or yield pessimistic estimates. Respecting the first possibility, let potential car buyers assess the reliability of new Saabs not by published frequency of repair data but by reference to what they know about cars in general and by what they can recall about Saabs. Evidence of this sort will include the experience of acquaintances and rumor, and it is likely to suffer from the biases of small sample sizes; that is, any one person's sample will have too few data points to reveal the correct odds for a particular model. On the other hand, the method will generate estimates that are influenced by the true odds, for two reasons. First, everyone has some knowledge of how cars in general perform, and the performance of Saabs is not excessively dissimilar from the norm. Second, the results of each person's sample will be affected by how reliable Saabs actually are. If Saabs always broke, no one could have a friend with a good word to say. Further, this method of acquiring information is unlikely to generate errors that always run in the same direction; some people may have had good

experiences with cars or know people with good Saabs while other people may have had bad experiences or know people with bad Saabs. Hence, if consumer estimates of the odds are influenced by their use of the availability heuristic, those perceptions seemingly should be unbiased in the aggregate.

Consumer errors may tend toward pessimism rather than randomness, however, because negative evidence is often more vivid than positive evidence. This fact is used to explain why people tend to draw insufficiently strong inferences from events that fail to happen.⁵¹ If a product performs well most of the time but fails noticeably, then, people may believe it to be less reliable than it is in fact because they give too little weight to the absence of failure, and too much to its presence. In addition, psychologists refer to a familiar "script" for defective cars. Scripts are dramatic stories people tell themselves to organize thought and experience.

Once evoked, this [automobile] script in turn can elicit a wealth of additional images and stored episodes about other "lemons" one has known. The "lemon" script is particularly rich and potent. With its cast of characters (impassive or evasive service managers, bumbling mechanics, snickering neighbors who told you that you could have had a nice Blatzmobile for half the price), and its stock scenes (waiting for buses in the rain, begging rides, bringing the car home only to hear some ominous new sound as you pull into the driveway), the lemon script is capable of strongly influencing one's inferences and behavior. Here statistics describing drive-train dependability records or average per-year costs are less likely to call up the rich and evocative lemon script and its various instantiations and are consequently less likely to influence our inferences and behavior.⁵²

In consequence of the vividness of much information about product failure and the relative pallidness of information about reliability,

the error component of people's estimates of the odds could be positive for consumers in the aggregate; they may overestimate the likelihood of defects.

The "representativeness heuristic" also may cause people to make mistaken probability assessments. A considerable amount of evidence suggests that people's search for causal candidates is excessively influenced by superficial similarities between a subset of the possible causes of the phenomenon under study and the phenomenon itself. A crude illustration is the theory that a child's timidity is caused by its mother being severely frightened during pregnancy. A more sophisticated version of the belief that outcomes actually are similar to or "represent" their underlying causes is the "gambler's fallacy." Each turn of a fair roulette wheel or the toss of a fair coin is uncorrelated with prior turns or tosses; hence, the probability that a particular turn will be red is slightly less than .5 (a zero and double zero exist), and the probability of a heads is approximately one half. A victim of the gambler's fallacy will assign a much greater probability than .5 to the chance that the next turn will produce a red or the next toss a heads, if a long run of blacks or tails has occurred. This is believed to occur because people perceive the process that generates outcomes to be random, and random sequences of reds and blacks or heads and tails seem more representative of such a process than a long run of blacks or tails.⁵³

The apparent pervasiveness of the gambler's fallacy suggests that people will make pessimistic assessments of product reliability.

Most products, particularly appliances, work reliably. Consumers, however, know that appliances are made by people; that "human error" often exists; and that industrial workers may lack the sense of craft their ancestors had. A consumer whose existing appliances work well and who holds this view of the industrial process could believe that his next purchase will be less reliable than his last; consistent success is unrepresentative of a system in which human error and a lack of craft sense will cause a nontrivial number of failures. In the gambler's fallacy simpliciter, the consumer's error is to overstate the correlation between the present and the past--a run of heads implies a tails next time; in this version, the error would be similar--too many product successes imply a forthcoming failure. There is some evidence that consumers actually make this error. A study by the Michigan Survey Research Center reported that people perceived a need for repairs in new home appliances that was considerably greater than the repairs they had experienced in past periods.⁵⁴ Hence, use of the representativeness heuristic also may bias people toward pessimism.

Finally, people sometimes tend not to insure against very low probability events, even when these events have high negative payoffs. For example, persons buy less flood and earthquake insurance than the objective probabilities warrant.⁵⁵ As applied to warranty issues, personal injuries are a much less frequent consequence of product defects than ordinary malfunction. Therefore, persons may ignore--in effect be optimistic about--the odds that products will harm them, and

demand less warranty protection against personal injuries than they should. This possibility cannot be dismissed, but, apart from an exception to be discussed below, it would be unwise to base policy on it. Initially, the theory underlying the refusal to insure phenomenon is poorly understood. One explanation is that it reflects cognitive dissonance.⁵⁶ A smart, prudent person would not buy a farm that has a nontrivial risk of being destroyed by a flood. Thus, people who own farms would ignore evidence of flood danger, and studies show that people in this circumstance are inadequately informed about the possibility of natural disasters. The warranty problem is set in the prepurchase context. Hence, the natural disaster case could support an inference that optimism exists in other areas, such as the case of personal injury from products, only if the price of land itself does not reflect the risk of flood or earthquake. Apparently, no one now knows whether it does or not.

The tendency to ignore low probability events may also reflect use of the availability heuristic. These sorts of events may seldom be in awareness because they occur rarely, so people respond inadequately to them. Some grounds exist for believing that the availability heuristic is partly responsible for the phenomenon. For example, while people may be insufficiently concerned with flood, fire and earthquake, there is great public concern about the risks of nuclear power and DNA, though the probability that these phenomena will cause harm is quite low. This may be because these latter risks are easily held in awareness, as they are much discussed and would

cause awful harms if they materialized; there may be "scripts" for nuclear meltdowns and genetic mutations.

If the availability heuristic is actually at work, it is premature to base policy on the penchant of people sometimes to ignore low probability events. What is needed but does not exist is a way to link the extent to which events may be in awareness with the objective probabilities that persons tend to ignore. For example, if a product carries a .01 risk of causing personal injury, will people act as if that risk is zero? How can a decisionmaker know when a risk of a particular harm is below the threshold of attention? If people are concerned about nuclear power but unconcerned about floods, could they be similarly concerned about cars but not about skateboards? That is, if it is the availability heuristic that is misleading people, are generalizations about odds thresholds warranted?⁵⁷ Until cognitive theory develops enough to permit answers to questions of this sort, that people insure insufficiently against certain kinds of low probability events cannot support factual inferences respecting other such events. And in the absence of such inferences, it seems unwise to require insurance by mandating warranties.

An exception to this conclusion may exist for frequently purchased, inexpensive items that cause serious personal harm a very small percentage of the time. No case for optimism in the purchase of these products can be derived from the representativeness or availability heuristics, but the cognitive dissonance paradigm may imply optimism. This is because consumers often will learn about the

possibility of dangerous malfunction after they have made a commitment to the product, for they frequently purchase it. Such negative information could be devalued. The risk that serious personal harm may occur from using such products as soda in bottles, nonprescription drugs and food thus could be in the class of risks against which insufficient insurance tends to be purchased.

(b) The Odds of Default

Are people optimistic respecting the odds of their own defaults, such that they will resist a creditor's demand for security less than their own better informed preferences would dictate? This question differs from the one just asked about products, for there the issue was whether consumers could correctly infer an objective frequency--the odds that a product would fail. In this case, people must predict the joint influence of their own abilities and objective circumstances. For example, a person about to make an auto loan must consider whether he or she is a sufficiently prudent manager to be able to make the payments under stable personal financial circumstances, and must also assess the likelihood of unemployment. People generally have as much data about their own abilities as outsiders do; we also have argued above that they are likely to have as much data about their objective circumstances as others will have. The question we take up here is whether the cognitive errors people may make in processing this data will bias them in particular directions.

Recent psychological theory suggests that people make self assessments in the same way that they assess other persons. In particular, people seemingly search for causal candidates to assess their own traits and actions, use theories to evaluate these, and make inferential judgments about them from objective events, just as they do when assessing outsiders; self knowledge seemingly is a product of much the same processes as knowledge of others. As an illustration, a person may come to believe that he is prudent not by consulting some peculiarly private mental source revelatory of his traits but by inferring the existence of the trait of prudence from facts relevant to how he has conducted his own financial affairs. If people actually make self assessments in this fashion, an outsider who observed these same facts would draw the same conclusion respecting the existence of prudence that the person himself did. And evidence shows that when actors and observers use the same theories and evidence to assess the actors' attitudes and judgments, both actors and observers reach similar conclusions. An actor, however, is believed to have an advantage over an observer because the actor often has more information.⁵⁸ Thus, if actors and observers have the same notion of prudence, a typical actor will be able to summon up more instances of his or her own behavior relevant to the existence of this trait than any observer can.

This analysis implies that a consumer--the actor--will make at least as good a judgment of how the interaction between his or her traits and circumstances will influence repayment prospects as a

bank--the observer--will, unless the consumer uses inferior theories to assess this interaction or uses the same theories as banks do but applies them badly. Both possibilities are nontrivial but neither would bias consumers in particular directions.

Respecting the use of inferior theories, persons often commit the "fundamental attribution error." Attribution theory in psychology "is concerned with the attempts of ordinary people to understand the causes and implications of the events they witness."⁵⁹ The fundamental attribution error is to put too much weight on characterological factors and too little weight on situational ones when assessing or predicting behavior. For example, people tend to attribute an honest act to an honest disposition rather than to the existence of factors that encourage honesty, such as that one's behavior is carefully monitored or that one needs the approval of those with whom one deals. Attributions are said often to be mistaken in life largely because psychologists have been able in laboratories to induce actors to perform widely divergent behaviors by varying situational factors. Another way to put this is that environments apparently exert greater influence over behavior than is commonly believed.

As applied to default issues, actors may be thought, in predicting the odds, to place too much weight on their own traits, such as prudence, and too little weight on situational factors, such as a shaky economy; hence, if persons routinely think well of their abilities they will be more sanguine about their repayment prospects

than their circumstances actually warrant. The fundamental attribution error, however, partly derives from the availability heuristic: people commonly have more salience for observers than situations have; in consequence, observers evaluating behavior tend to focus more on the influence of actors than on their environments. If this explanation is correct, people should commit the fundamental attribution error less when assessing their own behavior than the behavior of others; the actor, being always present, has relatively less salience for himself than circumstances do. The evidence is consistent with this prediction, showing that actors tend to see their own behavior as situationally determined while observers see the same behavior as dispositionally determined.⁶⁰ Hence, at this early stage in the understanding of these issues, there seems an insufficient basis on which to predict that people will be systematically optimistic about the odds because, thinking well of their abilities, they are led by the fundamental attribution error to give those abilities undue weight.

Lay persons also tend to slight statistical data. For example, a bank officer is likely to use statistical predictors such as past rates of default in similar consumer universes to guide lending practices,⁶¹ while individual debtors may rely on less probative factors, such as their own and their friends' histories. The errors that such methods could cause seem random. As an illustration, most people know that job loss is an important cause of default. If they evaluate this possibility by use of the availability

heuristic, they may overstate the likelihood of job loss if they personally know unemployed persons and understate it if they do not. Hence, if potential debtors use the availability heuristic, some of them could be pessimistic respecting the odds while others may be optimistic. Also, people using the representativeness heuristic may ask themselves whether their own traits and circumstances are like--are "representative of"--high risk or low risk debtors, rather than use statistical data as to default rates. This inferential process will mislead unless the traits that consumers believe predict default correlate strongly with the traits that actually do predict it. Unfortunately, no one knows whether consumers routinely focus on the wrong traits, nor is it known in which direction their errors may run. Thus, if consumers do use the representativeness heuristic here, rather than rely on base rate data, there is no way to predict the direction of their errors.

In sum, people sometimes may use inferior theories to evaluate the odds of their own default, but no reason exists to believe that these theories routinely will bias the users to be optimistic. Also, people to some extent will use the same theories that banks do; in assessing their ability to assume financial obligations, persons often look at their own incomes and job histories, just as lending officers do. Potential debtors probably make more mistakes when using the right theories than do firms, because the debtors have less expertise. But again, there is no reason to think that these mistakes lead to a systematically optimistic bias, nor is there any way to know how

serious they are.

4. Summary

The models set out in Parts II and III, supra, showed that firms are more likely to respond to the existence of imperfect information in the second sense--consumer ignorance of prices and terms--by charging supracompetitive prices, not by degrading contract quality. It seemingly followed from this that regulation to "improve" contract quality is often misconceived. This normative implication rested crucially on the assumption that imperfect information in the first sense did not exist--that consumers know the odds sufficiently well to choose contract terms correctly. Part IIIA(1) next argued that while individual consumers may make mistaken assessments of the odds that products are defective or that they will default on loans, it is wrong to focus on individuals. Rather, the question is whether consumer choices in the aggregate are correct because firms, in the circumstances discussed here, respond to consumers in the aggregate, not as individuals. It turns out that if consumer errors respecting the odds are unbiased or pessimistic, firms generally respond as if consumer choices are correct. But firms may exploit consumers in the sense of imposing unwanted contract terms or deleting preferred terms if consumer errors are optimistic in the aggregate. Hence, the normatively relevant question is whether general optimism respecting the odds exists. Part IIIA(2) then argued that consumers commonly have the incentive to acquire, and seemingly possess, enough data to make reasonably approximate predictions about the odds. Finally, Part

IIIA(3) argued, using cognitive theory, that while consumers are likely to misprocess this data, their errors in the aggregate respecting the odds of defects or defaults seemingly will be unbiased or pessimistic. Those two arguments are less likely to hold in one important circumstance, involving frequently purchased, inexpensive products that on rare occasions cause serious personal harm. Consumers may be optimistic respecting the risk of harm from such products, either because the risk is so slight as not to be in any consumer's consciousness or because cognitive dissonance causes consumers to understate the risk's magnitude. In the remaining cases, the preliminary normative implications of our models hold up under more realistic assumptions about what consumers actually know.

R. The Assumption that Consumers Cannot Affect the Odds

We supposed that consumers could not affect the odds that products will fail or that they themselves will default. If this assumption is relaxed, two possible difficulties may arise: first, moral hazard could exist; second, consumer preferences for contract terms could be heterogeneous. The former possibility has little effect on the conclusions reached above, but the latter possibility could sometimes make it difficult to use our models to evaluate actual markets.

Respecting moral hazard in connection with products, a warranty is an insurance policy against product related harms. The marginal cost to a consumer of using a product carefully always is positive (time and effort are costs), while the marginal gain of

further care seemingly is zero to a consumer who has already purchased a warranty, for the consumer is fully insured from the moment of sale. Hence, consumers with warranties could be less careful in their use of products--could increase the odds of defects--, as contrasted with consumers who do not have warranties; the warranty may create a "moral hazard."

Moral hazard is not important to the analysis made above for two reasons. First, it is unlikely to exist in this context. The standard market response to moral hazard is coinsurance; the insured bears part of the risk of accidents, as with deductibles in insurance policies. In this event, the insured has an incentive to take precautions. Respecting warranties, a form of coinsurance actually exists. Consumer durables are bought for use, and the buyers seldom keep spares. Also, firms require many warranty repairs to be made off the consumer's premises. Consequently, defects impose substantial costs on consumers in lost use, even when firms adhere fully to warranty obligations; the marginal gain of being careful is always positive and often large. Because of this, moral hazard should seldom be a serious problem.

Second, the existence of moral hazard does not contravene and may reinforce our conclusions as to how warranty markets work. Initially, the existence of moral hazard will increase the likelihood that competitive equilibria are sustainable. When all consumers prefer warranties, a necessary and sufficient condition for an equilibrium to occur in which only warranties are offered at

competitive prices is $a_1 s_W \leq \min\{a_W, a_N\}$. Here, s_W , the level of output in competitive equilibrium for a firm selling with warranties, equals $s(1-\pi)$. If consumers are more careless when they have warranties than when they do not, π rises and s_W falls; intuitively, firms will have to provide more replacements at any volume of sales, which causes output to fall. Also, the comparative advantages to firms of selling with and without warranties respectively are: $a_W = F+F'/h_W - c_W$ and $a_N = F/h_N - c$. If moral hazard exists, warranties are more important to consumers because warranties will save consumers greater precaution costs; consequently, h_W rises more than c_W , thereby causing a_W to fall. Should it cost relatively little to make a warranty (F' is small), however, s_W will fall faster than a_W . Then, from the theorem a competitive equilibrium is more likely to obtain. This is not to say that moral hazard is desirable; because it increases defects, it increases costs and thus prices. But these prices, are more likely to be competitive. In addition, when moral hazard exists, firms are more likely to respond to insufficient shopping by raising price not by reducing coverage. This is because moral hazard causes consumers to have a greater desire for warranty protection, and the likelihood that firms will have a comparative advantage at selling with warranties is in considerable part a function of the strength of consumer preferences for them. In a more technical vein, moral hazard causes h_W to rise and thus causes a_W to fall, but leaves h_N and consequently a_N unaffected (moral hazard cannot exist when no warranties are made). Since a_W falls relative to

α_N , firms are more likely to have a comparative advantage at selling with warranties. In sum, our analysis accommodates the possible existence of moral hazard; should it occur, competitive equilibria are more likely and firms are more likely to provide warranties when consumers want them, though in either case prices will be higher than when consumers are appropriately careful.

The existence of a security interest will not increase the level of moral hazard that otherwise exists in loan transactions. A consumer who has granted security is at a disadvantage after default relative to consumers who have not, since security gives a firm greater power to compel payment. Thus, consumers who grant security will be at least as careful respecting repayment prospects as those who do not.

Respecting the second difficulty, if consumers can affect the odds of product defects, they may have heterogeneous preferences for warranty coverage. For example, a consumer with ten children may prefer a stronger warranty on a washing machine than a consumer with no children. The existence of heterogeneous preferences will not affect our analysis if firms that offer warranties do not compete with firms that sell without warranties. Warranty and nonwarranty markets will "segment" unless two conditions are met:⁶² First, consumers who prefer warranties will buy products without warranties if their shopping discloses only firms that refuse to warrant, and consumers who do not prefer warranties will buy with them if their search discloses only firms that offer warranties. If this condition is not

met, in effect two markets will exist, in each of which firms sell homogeneous goods--products with and products without warranties. Second, the marginal cost to firms of making warranties exceeds the willingness to pay for them of consumers who do not prefer warranties but is less than the willingness to pay for them of consumers who do. To understand this condition, suppose that the marginal cost of making warranties exceeds the willingness to pay for them of consumers who do and who do not want warranties; then, no one would buy a product with a warranty. Suppose next that the marginal cost of warranties was less than the willingness to pay for them of all consumers; then, all consumers would buy with warranties. If markets segment because this second condition is not met, all consumers in a particular market would prefer warranties or none would; this in fact is the situation modeled in Part II, supra. Since neither of these conditions for "nonsegmentation" is trivial and both must be satisfied, an analysis that supposes consumers to have homogeneous preferences respecting warranty content seemingly applies in many cases.

When warranty and nonwarranty markets do interact, a competitive equilibrium will occur in both if enough consumers comparison shop,⁶³ but market interaction poses two problems. First, competitive equilibria are more difficult to sustain. Some firms in these markets sell with warranties and some without them. Such heterogeneity in market offerings dilutes the effectiveness of search. To see why, suppose that all shoppers visit no more than two stores. If a shopper who prefers warranties visits one store that

offers them and another that does not, he or she is effectively a nonshopper for both products; it is as if all firms offered warranties and the consumer went only to one of them. The effect is identical for consumers who do not prefer warranties. In short, if consumer shopping sample sizes are held constant, the effectiveness of search varies inversely with product and contract variety. Since competitive equilibria are a function of search effectiveness, they are less likely to occur when markets interact.

A second problem is that no one has yet characterized the equilibria that can occur in markets in which both products and consumers are heterogeneous and insufficient shopping occurs to sustain competitive outcomes. The practical importance of this failing is that neither the response of firms to insufficient search nor the features that characterize undesirable equilibria, and by which they can be recognized, are now known precisely. On the other hand, no reason exists to believe that interactive markets behave much differently than the markets modeled above, and we also know that reducing the costs of comparison shopping is likely to improve matters in such markets and usually will not hurt.⁶⁴

Consumers also could have heterogeneous preferences respecting security, though the essential similarity of loan transactions implies that this is less likely than heterogeneity respecting products. If it occurs, the analysis just made applies.

V. Generalizations and Policy Implications

Warranty terms allocate the risk of product defects between firms and consumers and security interest terms can make loans more or less risky for them. The analysis made above thus apparently applies prima facie to any contract term whose function is to allocate risk. With respect to any such term, the existence of comparison shopping together with a sufficient willingness on the part of consumers to pay for preferred terms seemingly should cause firms to satisfy consumer preferences. And consumers are unlikely to assess the risks to which such terms relate in ways that differ widely from those described above.

This suggests that much regulation of terms in consumer contracts on imperfect information grounds is misconceived. The regulation that we disapprove assumes individual consumers often to make mistaken risk assessments, supposes firms to exploit these mistakes by offering unwanted terms, and responds to this supposed exploitation by enacting into law those terms that consumers presumably do or should want. However, with respect to clauses that shift risks, consumer preferences seem entitled to controlling weight, and the most likely response of firms to the existence of imperfect information is to satisfy those preferences at excessive prices rather than frustrate them. Regulation should then be devoted, to a much greater extent than previously, to ascertaining when pricing problems actually exist and to remedying them. Before making suggestions as to how these are best done, we shall first discuss an objection to our

argument, which is that our notion of a correct choice is too restrictive. According to this objection, a choice cannot be correct unless: (i) it reflects a correct assessment of the odds, (ii) it reflects a correct appreciation of the market opportunity set; and (iii) the person holding the preference that generated the choice correctly predicts that the preference will persist over time. We neglect this possible third aspect of a correct choice. Are we justified in doing so?

A. Imperfect Information in a Third Sense

A central tenet of liberal theory is that persons' choices should control political and market outcomes. This tenet is easily derived from utilitarianism as it is commonly understood, from Kantian morality and from Judeo-Christian ethics.⁶⁵ Liberal theory accommodates the existence of imperfect information by recognizing two exceptions to consumer sovereignty, those discussed above: persons may be ignorant of the opportunity sets or of risks that they face. When either exception applies, state intervention of some sort is justifiable within the theory. In recent years, a third form of imperfect information has been thought to exist. The effects of many decisions that people make are felt years hence, and people's preferences change over time. Consequently, a person deciding whether to buy, borrow or vote must consider whether present choices will satisfy future preferences as well as present ones. People are said systematically to get this decision wrong; they often do not know what they will come to prefer. When private decisions involve an important

temporal aspect and imperfect information in the sense of being ignorant of one's future self exists, the state also is thought to have a legitimate justification for intervening. Decisionmakers should make laws that will satisfy people's future preferences when those are likely to be inconsistent with people's present preferences.⁶⁶

This third aspect of the imperfect information concept cannot justify regulation of contract terms because it derives from a form of utilitarianism that is unworkable in this context.⁶⁷ For this sort of utilitarianism to work decisionmakers ("planners") must have a comparative advantage over persons in predicting future preferences. As regards personal consumption decisions this advantage seems nonexistent. A person's future preferences are a function of: (i) how his or her present self will change as a result of internal growth and external circumstances, and (ii) those external circumstances. Respecting the first factor, the best predictor of how the self will metamorphose seemingly is past changes. Persons have much more data about their pasts than planners will. For example, a person who today prefers purchasing a house to renting an apartment has a lifetime of experiences on which to draw when asking herself whether this preference will persist. She knows how she has come to feel about previous dwelling places; how those dwelling places furthered or retarded her life's plan or otherwise affected her happiness; how her major consumption decisions have turned out, and so forth. No planner could know as much. Hence, planners could have a comparative

advantage over persons in predicting future preferences only when the planners are better able to predict the occurrence of future events that may alter these preferences.

The future events that could alter preferences respecting past consumption choices, however, are likely to be particular to individuals. For example, a person's present preference for an apartment over a house seems more likely to change as a result of his or her acquiring more wealth, a family or a new hobby, than because of a public commitment to nuclear power. People in general are better predictors of changes in their own circumstances than planners are. Thus, planners seem better able to predict future preferences as regards consumption choices only in the unusual cases when those preferences may alter as a result of events of widespread consequence, that planners are better able to anticipate and comprehend.

Even this apparent advantage dissolves under analysis. The planner has no specific information about each of the many people whose preferences are at issue, and so his task is to decide how the typical person's preferences will alter as a result of major changes in public policy or social relations. To make such predictions requires a theory, of a psychological or psychiatric sort, as to how preferences alter over time in response to particular external stimuli or particular changes in the external environment. No such theory exists. In consequence, the likely outcome of attempts to predict future preferences will be the substitution of the planners' preferences for those of their constituents. For example, a planner

who thinks that security interests should be banned because they will operate harshly against consumers in the coming hard times is strongly predisposed to predict that if security interests are banned consumers will come to prefer their absence. Regulation made in this fashion must be justified by reference to the planner's preferences, not those of the persons whose decisions may be overridden.

To summarize, regulating consumption decisions on the basis of persons' future preferences is arbitrary, in the sense that no particular regulation could be justified by the utilitarianism that purports to justify the entire project of regulating on the basis of future preferences. This is initially the case because persons have more data than planners do about their own selves and how these are likely to alter in response to future circumstances, and commonly are better able to predict the occurrence of future preference affecting events. Also, when planners are better able to predict or understand the occurrence of events of widespread consequence that could influence preferences, they are still unable to predict preference changes because they lack a theory relating events to changes. When planners are authorized to act but lack both data and a theory that could guide their actions, they most probably will plan by reference to their own conception of the common good. In consequence, regulation of consumption decisions on the basis of supposed predictions of persons' future preferences cannot be justified by utilitarianism at all, for such regulation will be related to these preferences only by happenstance. Nor is it easy to derive a

justification from deontological schemes now in frequent use, such as those premised on respect for persons. Under prevailing notions of political morality, then, persons' present preferences respecting contract terms should be regarded as controlling unless imperfect information in either of the senses discussed above exists.

B. Policy Implications

Imperfect information to which the state should respond may exist in two forms--consumers are ignorant of the opportunity sets they face or of the odds of misfortune implicit in particular choices. The state can respond to either form by banning a particular term or requiring disclosure respecting it. We shall discuss each possible response.

(1) Banning Contract Terms

A decisionmaker may ban a particular term altogether. For example, some states have prohibited disclaimers in sales of consumer goods. We refer to this as a "general ban." The decisionmaker also can take a case by case approach; he or she could, as an illustration, ban disclaimers only when firms in a particular market have a comparative advantage at selling without warranties and too little comparison shopping occurs there to sustain a competitive equilibrium. We refer to this as a "particular ban".

General bans seldom are an appropriate response to the existence of imperfect information in its ignorance of choice sets aspect. Firms are more likely to respond to this form of imperfect

information by raising prices for those terms that consumers do want, rather than by offering unwanted terms. Hence, general bans are likely to be inconsistent with consumer preferences. Also, it apparently takes a relatively small amount of comparison shopping to prevent firms from altogether neglecting consumer preferences respecting contract terms.⁶⁸ Therefore, if a widespread degradation of contract quality response by firms to insufficient consumer shopping is suspected, a disclosure solution probably will yield a satisfactory outcome.

General bans of terms that allocate risks because consumers cannot accurately value these risks will be inappropriate in most cases. The relevant questions are whether consumers systematically underestimate the true odds, and whether their ignorance will persist. Answers to these questions are context dependent and difficult. Using products as an example, we suggested that people may be pessimistic largely because they tend to attach excessive weight to vivid data; negative information, such as a spectacular accident, is more vivid than the simple absence of failure. On the other hand, vivid positive data about a particular item could come to dominate for a time. A new product could have obvious attractions but subtle drawbacks. Consequently, a decisionmaker should presume pessimism or unbiased estimates as regards warranties, but be open to the possibility of consumer optimism in particular cases. In such cases, however, the situational factors that affect consumer risk assessments could change. To recur to the example above, if the new product begins to

fail in dramatic fashion, optimism could become pessimism. Such changes in situational factors are difficult for decisionmakers to predict. This analysis suggests that general bans of terms because consumers will make incorrect choices respecting them are justifiable only when systematic optimism is likely both to exist and persist. We have identified one such case, involving frequently purchased, inexpensive items that malfunction so as to cause personal injury a very low percentage of the time. Strict liability is appropriate for transactions involving such products. Otherwise, general bans of terms on information grounds are without justification.⁶⁹

Case by case determinations, such as those that courts make under the unconscionability doctrine, seem more justifiable but should seldom cause terms to be banned on information grounds, for three related reasons. First, imperfect information in either aspect will cause firms to deteriorate contract content only in a minority of cases. Firms respond to the ignorance of opportunity sets aspect more by raising prices than by offering unwanted terms, and respond undesirably to the ignorance of the odds aspect only when systematic optimism exists, which apparently occurs infrequently. Thus, when a clause is challenged on information grounds, courts should assume, in the absence of evidence to the contrary, that the term accurately reflected consumer preferences. Second, courts will have difficulty acquiring the data required to overcome this presumption. The existence of some consumers who did not shop or of many consumers who might have mistaken the odds are an insufficient basis on which to ban

a term. Rather, courts must ascertain whether the factors that correlate with poor market performance, such as little comparison shopping, a weak willingness to pay for preferred terms, and a pervasive underestimation of the odds, existed when the term was used. Law suits involving consumers will seldom be about stakes that will induce the litigants to incur the considerable expense of providing evidence relevant to these factors. Third, a sensible judicial response to the fact that firms generally will satisfy consumer preferences respecting terms, but that it is difficult to know when firms have not done so, is to allow decision to be influenced by the gravity of the risk at issue. For example, the presumption against bans may be relaxed or abandoned when the contract has shifted to a consumer a risk of large magnitude, such as buying a car that is a lemon. It is in just these cases, however, that consumers are likely to search for information about the product, and to pay attention to the information they get. The presumption that firms are satisfying consumer preferences thus should be strengthened rather than weakened when the stakes increase.⁷⁰ This suggests that a court should ban a term on information grounds when the risk that the term shifted has a relatively low value but the term is widely used, so that the possible total efficiency loss it causes could be large, and the evidence suggests that it is the wrong term. How many such clauses there are seems unknown, nor will such cases be litigated frequently. And these three reasons, taken together, imply that though particular bans can be justifiable, decisionmakers should be less inclined to enact them

than they have been.

(2) Requiring Disclosure

The apparent solution to the ignorance of the odds problem is to require the odds to be disclosed. Decisionmakers, however, would face significant practical difficulties in obtaining odds information, developing concise and comprehensible disclosure formats, and causing information to be presented in such fashion that consumers will pay attention to it. For example, a car could fail in several ways and in varying degrees. Aggregating different failure probabilities into a composite failure probability seems very difficult, while presenting consumers with a series of discrete estimates may be more confusing than useful. Also, if product reliability is viewed as an output, both the firm and the consumer provide inputs to it; that is, failure in a function both of manufacture and of use. Because firms cannot observe use patterns except at great cost, they may be unable to disclose "true" failure probabilities.⁷¹ Further analysis may show such difficulties to be less serious than they now appear but in its absence we suspect that strict liability is a more efficient solution to any ignorance of the odds problems that now exist.

Respecting ignorance of market choice sets, the extent of comparison shopping varies inversely with the costs to consumers of comparing market alternatives. Hence, the question is how to reduce these costs. We suggest three methods. First, contract terms that may be of concern should be disclosed in standard fashion. All security interest clauses, for example, should be required to read in

the same way, except in so far as individual items dominate, such as descriptions of the collateral. Standardization is preferable to plain language laws, which commonly require disclosures to be made in clear and simple fashion.⁷² The goal here is to facilitate comparisons across firms; this is best done by requiring firms to use the same language. This language may be more abstract or complex, and thus more difficult to read, than the contracts that a particular plain language statute may require. The relevant comparison, however, is not between the costs to a consumer of reading one contract written in relatively difficult or in relatively simple language. The standard contract would be used by all firms, and once mastered is mastered forever. Hence, the comparison is between the costs entailed in reading many different simple contracts or in reading one standard complex contract. The latter task seems cheaper than the former and is thus more likely to be done.

A second method of reducing shopping costs is to require firms to give price and important contract term quotes over the phone. The quotes need be effective only for short periods--"our price is \$100 until Friday"; also, firms could charge less but not more than the quoted prices. Many firms now quote prices by phone, so the proposal is not farfetched. The obvious difficulty is the consumer who calls a department store and requests information about thirty items, but problems of this sort could be ameliorated by permitting firms to limit the number of quotes per caller or by requiring them to provide quotes only for expensive items. The cost reducing potential of

telephone shopping seems great enough for this reform to be tried.

A third reform is to subsidize the production and distribution of lists of the prices and important contract terms that firms offer. If consumers have this information before they begin to shop, firms will face considerable pressure to offer competitive prices and preferred terms; and the evidence shows that providing comparative price data yields lower prices. We have discussed elsewhere the practical difficulties involved in providing this information⁷³ and want to call attention here to two vehicles for the transmission of comparative data whose use has been insufficiently explored, "teletext" and "videotex."⁷⁴

Teletext is a one way communication system that broadcasts information or sends it on cable to homes where it appears on TV screens; videotex is a two way communication system, whereby a person requests information by phone, which is then transmitted to appear on a TV screen. Comparative price and term data could be sent in either medium, and would plainly facilitate interfirm comparisons. Cable television companies do sometimes transmit price data, so this proposal also has a real world analogue. There are a large number of cable channels, and twenty eight percent of American homes now have cable, a percentage which is expected to increase considerably. When shopping problems are perceived to exist, the state should therefore seriously consider transmitting comparative price and term data over selected cable channels, or over teletext should it become more widely used.

Conclusion

Consumer contracts are frequently regulated on imperfect information grounds, but this regulation is itself uninformed. Imperfect information exists when consumers choose contract terms incorrectly because they are uninformed about risk, or when consumers are ignorant of the full array of choices that firms can offer. We show that firms are likely to respond to the existence of imperfect information in this latter sense by charging supracompetitive prices for those contract terms that consumers prefer; firms will less often offer unwanted terms. The best remedy for this second aspect of the imperfect information problem is to reduce the costs to consumers of comparing the offers of different firms; comparison shopping drives prices down and reduces further the likelihood that firms will frustrate consumer preferences respecting terms.

Imperfect information in the sense of incorrect choice is thought to be pervasive, but this is because decisionmakers and commentators focus on representative individual consumers, each of whom may lack the data and skill to calculate risks perfectly. Firms, however, commonly respond to consumers in the aggregate, not as individuals; hence, the question is whether consumer mistakes respecting purchase risks in the aggregate are systematically biased such that firms will act as if each consumer will make incorrect choices. If consumers as a group make errors respecting the odds that are either systematically pessimistic or unbiased, firms generally will respond as if their choices were correct. Also, pessimistic

choices seldom seriously disadvantage consumers. Firms have an incentive to exploit consumers only if consumers routinely understate the adverse consequences of purchase choices, and an analysis of the psychological literature dealing with cognitive error suggests that such systematic consumer optimism respecting the odds exists only in a small set of cases.

Much regulation of contract terms on information grounds is devoted to "improving" contract quality by banning contract terms that are thought to be the product of incorrect consumer choices. The analysis above shows that the presumed existence of imperfect information can seldom support such bans; consumer contracts by and large correctly reflect consumer wants. Courts, however, should be free to ban terms in use in particular markets when imperfect information exists there, though we believe that appropriate cases for such action arise less frequently than is commonly supposed. The principal imperfect information problem, instead, is that its existence is likely to cause contract terms to be offered at supracompetitive prices. Disclosure regulation seemingly responds to this problem, but a good part of such legislation that is now in place is devoted to explaining particular transactions to consumers rather than facilitating the ability of consumers to shop comparatively for prices and terms. Such regulation is at best a partial response to the imperfect information problem. Therefore, attention should now turn to the unresolved theoretical difficulties involved in recognizing when markets are behaving badly for informational reasons,

and to the practical difficulties involved in implementing the most promising remedy, a reduction in the costs of comparison shopping.

Footnotes

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1. Many of these regulatory initiatives are discussed in Schwartz and Wilde, Intervening in Markets on the Basis of Imperfect Information: A Legal and Economic Analysis, 127 U. Pa. L. Rev. 630(1979) (herein cited as "Intervening in Markets") and Beals, Craswell and Salop, The Efficient Regulation of Consumer Information, 24 J. Law and Econ. 491(1981).
2. A fuller justification of the view that the state should intervene in markets on information grounds only when noncompetitive equilibria occur is given in Intervening in

Markets 635-39,666-71. We do not discuss two possible objections to this premise. The first, using products as an example, is that poor consumers may prefer to give up warranties so that they may buy decent shelter; to describe a market outcome that reflects this preference as desirable is morally wrong. This objection is irrelevant to our analysis. The poor consumers in the illustration are assumed to make informed choices, and we are concerned here only with the question when the existence of uninformed choices should ground regulatory interventions. Requiring firms to make warranties also would not help consumers put to the choice between shelter and warranties; these consumers would be made worse off by the requirement for they prefer the former but are compelled to take the latter. Potentially better solutions to the wealth distribution concern that generates this objection are to make transfer payments to poor consumers or to subsidize the production of warranties. The latter possibility is discussed in Schwartz, A Re-examination of Nonsubstantive Unconscionability, 63 Va. L. Rev. 1053,1063-64(1977). A second set of objections to our premise that competitive equilibria are prima facie desirable follows from the view that it is morally problematic for the state to give controlling weight to presently held preferences. Initially, such preferences may be "adaptive." An adaptive preference reflects a more or less unconscious adjustment on the part of the preference holder to evil social conditions. For example, persons may come to prefer discipline

as a way to make tyranny psychologically tolerable. Such preferences have little normative value. See, e.g., Elster, Sour Grapes - Utilitarianism and the Genesis of Wants in Utilitarianism and Beyond 219 (eds. A. Sen and B. Williams 1982). Similarly, people sometimes may consume in a manner inconsistent with their actual best interests; they may, that is, consume excessively or without regard to the effect of their consumption decisions on others whose interests they profess to hold important. This occurs because the ideology of a market economy regards self interested consumption as desirable behavior, and thereby prevents persons from recognizing that their present preferences are inconsistent with their real wants and needs. See R. Guess, The Idea of a Critical Theory (1981). We make the perhaps strong assumption that these varieties of false consciousness do not exist. We do not know how to distinguish "ordinary" preferences for contract terms from adaptive or otherwise false preferences. Given this inability, the question is whether to regard particular preferences as provisionally true or false. We regard them as true because this is more consistent with a respect for the autonomy of persons. Part V A, infra, does discuss a final difficulty with allowing present preferences to control, that they may be unstable over time.

3. These states are Kansas, Maine, Maryland, Massachusetts, Vermont and West Virginia.
4. 88 Stat. 2103, section 103

5. See A. Schwartz and R. Scott, Commercial Law: Principles and Policies 200--6 (1982).
6. Cal. Civil Code section 1793.2 as amended by Assembly Bill no. 1787 ("Warranties-Motor Vehicles-Repairs") (1982).
7. See, e.g., Schwartz, supra note 2.
8. Uniform Consumer Credit Code section 3.301.
9. These laws are summarized and discussed in Schwartz The Enforcement of Security Interests in Consumer Goods, 26 J. Law and Econ. 117 (1983). Restrictions on the taking of security interests often are justified on noninformational grounds, such as that creditors allegedly fail to maximize the proceeds from repossessed collateral. The Schwartz paper argues that such justifications are unpersuasive; hence, the security interest legislation referred to in the text is evaluated here in informational terms.
10. See Landers and Rohner, A Functional Analysis of Truth in Lending, 26 U.C.L.A. L. Rev. 711 (1979); Intervening in Markets 677. This paper discusses two aspects of the imperfect information concept, that consumers are ignorant of risks or market opportunity sets. Lawyers sometimes claim that a third aspect exists: consumers do not understand the legal relationship that obtains between them and firms because they cannot read the language in consumer contracts. See, e.g., Davis Revamping Consumer Credit Law, 68 Va. L. Rev. 1333 (1982). We believe that this claim is overstated, at least as regards

- warranties and security interests. See note 35, infra, and text at note 72, infra. The typical response to this imperfect information problem is to make contracts more comprehensible. See statutes cited in Davis, supra, at n.48, p.1345 and n.54, p.1347.
11. For representative explanations, see Grossman, The Informational Role of Warranties and Private Disclosure About Product Quality, 24 J. Law and Econ. 401 (1981); Spence, Consumer Misperceptions, Product Failure and Producer Liability, 44 Rev. of Econ. Studies 561 (1977).
 12. See Priest, A Theory of the Consumer Product Warranty, 90 Yale L. J. 1297 (1981).
 13. See Schwartz and Scott, supra note 9 at 189-94, 196-206.
 14. The welfare effects of signalling equilibria are very hard to evaluate. Such equilibria, when they exist, reflect only the sustained confirmation of a party's beliefs. Thus, if consumers believe warranty coverage to correlate positively with product durability and if sellers with more durable products incur lower costs in making warranties than do sellers with less durable products, the former sellers have an incentive to make more extensive warranties. If they actually do so, a signalling equilibrium might arise in which warranty coverage varies directly with durability; in this event, the informational content that consumers attribute to the warranty signal is confirmed by the signals they see. This equilibrium would be

efficient, however, only if the increased costs to firms of sending such warranty signals are less than the welfare gains to consumers of being able to distinguish more accurately among products on the basis of durability. This comparison is very difficult to make.

15. Early but still interesting comparative advantage explanations are found in G. Calabresi, *The Cost of Accidents*, 161-73(1970); O. The Economics of Product Safety, 4 Bell J. 3(1973); McKean, Products Liability: Trends and Implications, 38 U. Chi. L. Rev. 25(1970).
16. U.C.C. sections 2-712 - 2-715.
17. See Priest, supra note 12.
18. Id. at 1347.
19. Id.
20. The search theoretic literature is recently reviewed in Schwartz and Wilde, Imperfect Information, Monopolistic Competition, and Public Policy, 72 Amer. Econ. Rev. 18(Papers and Proceedings 1982).
21. These models use the Nash equilibrium concept. Each actor in an environment such as a market is assumed to pursue a specified strategy, designed to achieve a particular objective, such as to minimize purchase costs or maximize profits. A set of strategies is in a Nash equilibrium when no actor has an incentive to alter his or her strategy, given that the other actors continue to pursue their strategies; because no one has an incentive to

change, a market outcome described by such a Nash equilibrium set of strategies is stable. Conversely, when at least one actor has an incentive to alter his or her strategy, given that other actors continue to pursue their strategies, a market outcome described by such a strategy set is not in equilibrium; the outcome is unstable. From a normative viewpoint, the equilibria in a model reflect the model's predictions of what the world is like. They are thus useful to decisionmakers in understanding and evaluating market outcomes. For a fuller explanation, see *Intervening in Markets* 640-41.

22. This model is set out in Wilde and Schwartz, Equilibrium Comparison Shopping, 46 Rev. Econ. Studies 543(1979).
23. See *Intervening in Markets* 646-49.
24. Sadanand and Wilde, A Generalized Model of Pricing for Homogeneous Goods Under Imperfect Information, 49 Rev. Econ. Studies 229(1982).
25. If each consumer is assumed to have an individual limit price, one could derive a demand function for every firm from the distribution of individual limit prices; the model would then behave similarly to that found in Sadanand and Wilde, supra note 24. Search models typically do not do this because their results are qualitatively unchanged under the simplifying assumption.
26. For example, two researchers provided consumers with some comparative price information and with a weighted index of prices on 65 common food items for supermarkets in a Canadian city for a

- five-week period. Prices in the sample market declined substantially and price dispersion decreased during the experimental period, while prices and dispersion were largely unaffected in the control market. See Devine and Marion, The Influence of Consumer Price Information on Retail Pricing and Consumer Behavior, 61 Am. J. of Agric. Econ. 228(1979). This study was replicated in McCracken, Boynton and Blake, The Impact of Comparative Food Price Information on Consumers and Grocery Retailers: Some Preliminary Findings of a Field Experiment, 16 J. Cons. Affairs 224(1982). Other studies report similar findings. See McNeil, Nevin, Trubeck and Miller, Market Discrimination Against the Poor and the Impact of Consumer Disclosure Laws: The Used Car Industry, 13 Law. and Soc. Rev. 699(1979); Russo, Kreiser and Miyasuita, An Effective Display of Unit Price Information, Journal of Marketing (April 1975), at 11. Several studies also report lower prices where price advertising is permitted than where it is not. See Craswell, Tie-ins: The Consumer Protection Aspects, 62 Houst. U. L. Rev. 661,676 n.63(1982) (summarizing studies).
27. Schwartz and Wilde, Competitive Equilibria in Markets for Heterogeneous Search Goods Under Imperfect Information: A Theoretical Analysis with Policy Implications, 13 Bell J. Econ. 181(1982).
28. Technical versions of this model appear in Schwartz and Wilde, Consumer Markets for Warranties, Cal. Inst. of Tech. Social

Science Working Paper no. 445(1982); Schwartz and Wilde, Warranty Markets and Public Policy, 1 J. of Information Econ. and Pub. Policy ___(1983)(forthcoming). The present discussion is meant to make the technical analysis accessible to lawyers, and to stress its normative implications.

29. We make this assumption because it is analytically tractable. Its essential feature is that the making of a warranty raises a firm's marginal cost and reduces its effective output (because it must provide for replacements). Any warranty that has these features, such as a promise to repair or replace, is captured by our model.
30. Under the Magnusson-Moss Act, a firm makes a full warranty if it agrees to remedy defective products at no charge "within a reasonable time", not limit the duration of implied warranties, and replace any defective products it cannot fix. Lesser warranties must be denominated "limited." See Magnusson-Moss Act sections 103;104.
31. The text describes models of warranty markets in two special cases, when all consumers prefer warranties and when none do. We have not modeled the intermediate case, when some consumers prefer warranties but others do not. This case is less important normatively than the models set out above, is quite tedious to analyze and is unlikely to yield different results. The two polar cases imply outcomes that run in the same direction--firms in both cases commonly respond to insufficient shopping with

higher prices rather than lowered contract quality; an intermediate case is unlikely to imply outcomes that run in a different direction. In a related model, we characterized necessary and sufficient conditions for competitive equilibria to obtain in markets for goods of different qualities when consumers have heterogeneous quality preferences. See Schwartz and Wilde, supra note 27. This model yielded results that are consistent with those described above. The relevance of heterogeneity to our conclusions is further pursued in Part IVB, infra.

32. See text at notes 68-70, infra.
33. This pattern used to describe consumer and commercial warranties, but the former have been modified by the Magnusson-Moss Act, which prohibits disclaimers of implied warranties if firms make express warranties, and by the strict liability in tort doctrine, which requires firms to bear the risk of consumers' personal injuries. See also UCC 2-719(3). Warranty patterns are described in Schwartz and Scott, supra note 5, at 189-94 and Priest, supra note 12.
34. This illustration supposes π to be .01. Then, if $c = \$45$, $c_W = \$46$ because $c_W = \frac{c}{1 - \pi}$.
35. Searching for warranties may be more costly than searching for prices, and thus less term search may occur, because it often will take more time to absorb and compare information about terms than about prices. See Intervening in Markets 660. The illustration suggests that when this cost difference is

significant, the likely result is supracompetitive pricing for terms rather than provision of the wrong terms. If consumers care almost not at all about terms, however, their limit prices for contracts with a particular term will be quite close to their limit prices for those contracts without the term. In this case, firms are likely to have a comparative advantage at selling without the term. Studies of consumer awareness of warranty terms suggest that consumers care enough about warranties to make this possibility negligible. See Darden and Rao, A Linear Covariate Model of Warranty Attitudes and Behaviors, 16 J. Mark. Res. 466(1979); Whitford, Strict Products Liability and the Automobile Industry: Much Ado About Nothing, 1968 Wis. L. Rev. 83,146-51. Also, no one claims that consumers are unaware of their creditors' right to repossess on default when security interests exist. Most commentators believe that consumers have preferences respecting the security term.

36. The Renault Alliance, for example, is unlikely to compete with the Mercedes 300SD. The existence and relevance of product and consumer heterogeneity are discussed in more detail in Part IVE, infra.
37. A technical version of this model is given in Schwartz and Wilde, Some Results on Consumer Financial Markets and Security Interests Under Imperfect Information, (1982) which is attached as an appendix. Several explanations of why security is given exist, such as that security reduces net lending costs or signals the

creditworthiness of debtors. None of these explanations is persuasive. See Schwartz, Security Interests and Bankruptcy Priorities: A Review of Current Theories, 10 J. Leg. Stud. 1(1981). We are concerned here, however, not with why security is used but only with whether imperfect information will cause it to be used in ways that frustrate consumer preferences.

38. This assumption is made for convenience. The model's qualitative results are unchanged if other common forms of security are assumed.

39. Firms have more difficulty recovering consumer goods in bankruptcy than this assumption suggests, partly because bankruptcy courts can stay the enforcement of security interests, and also because consumers in some cases can keep the collateral if they make specified payments on it. See Bankruptcy Code sections 362, 542(f), 1322 and 1325. This difficulty in foreclosing can be captured by substituting for V an expected value for the collateral, $E(V)$, where $E(V) < V$. The analysis then goes through unaffected.

40. See Intervening in Markets 656-58.

41. See Sadanand and Wilde, supra note 23.

42. See authorities cited in note 26, supra.

43. The text assumes that firms cannot learn enough about consumers in typical consumer transactions to offer each consumer a different contract, based on that consumer's sophistication. The pervasiveness of standard form contracts is consistent with this

supposition. See Leff, Contract As Thing, 19 Amer. Univ. L. Rev. 131(1970). To be clear about the argument that follows, this paper adopts the standard assumption that consumers hold beliefs about the odds, and that these beliefs influence purchase choices: consumers who think products are reliable will care less about warranties than consumers who think products are likely to fail, other things equal.

44. We assume that all consumers in a market hold similar views respecting the odds, but the shoppers may hold different views. Firms respond to the shoppers, so a question arises whether the analysis is affected if the shoppers and nonshoppers differ. The answer is no because the shoppers will probably be more pessimistic than the nonshoppers when the two groups differ. To understand the effect of this relative pessimism, consider three cases. First, all consumers would prefer warranties were they properly informed, the nonshoppers hold unbiased or pessimistic views respecting the odds, and the shoppers are pessimistic. Since firms respond to such pessimists who shop as if they make correct choices, when the nonshoppers hold unbiased or pessimistic views the relatively greater pessimism of the shoppers is irrelevant; in both cases, firms will act as if all consumers make correct choices. Second, all consumers would prefer warranties were they properly informed, the nonshoppers are optimists, and the shoppers are pessimistic. As we next show, if all consumers are optimists a policy problem exists, but

the effect of optimism by the nonshoppers may be moderated by the relatively greater pessimism of the shoppers. For example, firms may offer warranties in response to the shoppers' pessimism. Third, no consumers would prefer warranties were they properly informed, the nonshoppers hold correct or optimistic estimates in the aggregate and the shoppers are pessimistic. Firms may respond to the shoppers by offering unwanted warranties, but the text argues that this is not a serious problem. Hence, if shoppers and nonshoppers hold different views respecting the odds, but the shoppers are relatively more pessimistic than the nonshoppers, the analysis above is unaffected. The shoppers probably will be more pessimistic than the nonshoppers when the two groups differ because, as we later show, an important motivator of search behavior is the perception by consumers that purchases are risky. Consumers search for information about products in part to reduce the psychological discomfort that would otherwise be experienced by bearing risks. See text at notes 45-46, infra. Since pessimists are likely to experience this discomfort while optimists are likely not to, shoppers as a class will if anything be more pessimistic than nonshoppers.

45. The perceived risk literature is surveyed in Ross, Perceived Risk and Consumer Behavior: A Critical Review, in Volume 2 Advances in Consumer Research 252(1975).
46. See Ross, supra note 45; Intervening in Markets 648. A recent study also reported considerable search for consumer durables and

for the credit with which to finance their purchase. The average number of store visits by consumers in the researchers' sample was 3.49, and these consumers averaged one additional visit to a "cash loan source," such as a bank. Because the stores also offered credit, the consumers in fact made several visits to creditors as well as to stores. See Shay and Brandt, Consumer Credit Protection Legislation and Consumer Credit Shopping: Truth-in-Lending and Equal Credit Opportunity Acts in The Costs and Benefits of Public Regulation of Consumer Financial Services 163, 242-43 (Report for National Science Foundation under NSF/RANN Grant NSF-C76-18548 1980). See also, Westbrook and Fornell, Patterns of Information Source Usage Among Durable Goods Buyers, 16 J. Mark. Res. 303(1979) (68.6% of consumers in sample visited two or more stores when shopping for durable goods; 46.2% also used "neutral" information sources such as books and magazines).

47. This psychological literature is thoroughly reviewed in R. Nisbett and L. Ross, Human Inference: Strategies and Shortcomings of Social Judgment (1980) (herein cited as "Human Inference"). Another valuable source is Judgment Under Uncertainty; Heuristics and Biases (eds. D. Kahneman; P. Slovic; A. Tversky 1982) (herein cited as "Judgment Under Uncertainty"). Whether a person is making a cognitive error must be decided by reference to the task the person is attempting to solve. Thought processes that routinely generate errors when persons are performing discrete,

relatively simple tasks may be functional in environments in which the actors make continuous decisions and receive feedback, or in environments "of great complexity." See Einhorn and Hogarth, Behavioral Decision Theory: Processes of Judgment and Choice, 31 Ann. Psychol. Rev. 53,73(1981); Hogarth, Beyond Discrete Biases; Functional and Dysfunctional Aspects of Judgmental Heuristics, 90 Psychol. Bull. 197(1981); Lopes, Some Thoughts on the Psychological Concept of Risk, 9 J. Exper. Psychology: Human Perception and Performance 137(1983). In the discussion that follows, we assume that the task of choosing contract terms is discrete and relatively simple, so that the thought processes that have been shown to produce errors in other contexts will produce the same errors in this context. Also, the concept of rationality has at least two aspects: a person is behaving irrationally if he chooses means that are unlikely to achieve his ends or if he pursues crazy ends. The literature on cognitive error presupposes the rationality of persons' ends in the environments in which these persons are studied, but claims that people pursue these ends irrationally because they systematically make mistakes. We adopt this approach here, for we suppose consumers to hold rational preferences for contract terms and then ask whether consumers will make correct--rational--choices when acting on these preferences. The entire line of psychological research used here is strongly, though in our view not persuasively, criticized in Cohen, Are People

Programmed to Commit Fallacies? Further Thoughts About the Interpretation of Experimental Data on Probability Judgment, 12 J. for the Theory of Social Behavior 251(1982).

48. An analysis of cognitive dissonance as it may apply to economic issues is found in Akerloff and Dickens, The Economic Consequences of Cognitive Dissonance, 72 Amer. Econ. Rev. 307(1982).
49. Id.
50. Human Inference, 45-59.
51. Id. at 45-49.
52. Id. at 54. It also is apparently the case that consumers attach disproportionate weight to negative information about products. See Mizerski, An Attribution Explanation of the Disproportionate Influence of Unfavorable Information, 9 J. Cons. Res. 301(1982).
53. See, e.g., Kahneman and Tversky, Subjective Probability: A Judgment of Representativeness, in Judgment Under Uncertainty at 32; Zukier, The Dilution Effect: The Role of the Correlation and the Dispersion of Predictor Variables in the Use of Nondiagnostic Information, 43 J. of Personality and Social Psych. 1163(1982).
54. The study is cited in Courville and Hausman, Warranty Scope and Reliability Under Imperfect Information and Alternative Market Structures, 92 J. Bus. 361(1979). The authors do not interpret the results
55. Much of this research is described in Slovic, Fischhoff and Lichtenstein, Regulation of Risk: A Psychological Perspective, in

Regulatory Policy and the Social Sciences ____ (R. Holl, ed., forthcoming 1983). See also Slovic, Fischhoff, Lichtenstein, Corrigan and Combs, Preferences for Insuring Against Probable Small Losses: Insurance Implications, 44 J. Risk and Ins. 237(1977).

56. This is suggested in Akerloff and Dickens, supra note 48.
57. Surveys show that people overestimate the frequency of deaths from some causes, such as accidents, homicides and tornadoes, and underestimate the frequency of deaths from other causes, such as smallpox vaccination, diabetes and asthma. These mistakes are attributed to the availability heuristic. See Slovic, Fischhoff and Lichtenstein, Facts versus Fears; Understanding Perceived Risk in Judgment Under Uncertainty 463, 465-67.

Psychologists have been attempting to develop general theories that explain the use of the heuristics described above. Two observers recently stated:

[A]ll these theories claim that in an inference situation the subject's decision is a function of the subset of the most salient dimensions which are processed sequentially in order of salience.

Wallsten and Barton, Processing Probabilistic Multidimensional Information for Decisions, 8 J. Exper. Psych.: Learning, Memory, and Cognition 361,362(1982). Experimental tests of this hypothesis yield results that are consistent with it but also are far from conclusive. See id. The hypothesis does suggest,

though, that the failure to insure against some low probability events is a function of the low salience that these events have for the persons they may affect. In the terms used above, the availability heuristic may partially account for the failure to insure phenomenon.

58. The research on which this paragraph is largely based is reported in Human Inference 196-225. See also, Kassirjian, Consumer Psychology, 33 Ann. Rev. Psychol. 619,633-34(1982); K. G. Shaver, An Introduction to the Attribution Process 73-92(1975).
59. Ross and Anderson, Shortcomings in the Attribution Process: On the Origins and Maintenance of Erroneous Social Assessments in Judgment Under Uncertainty 129.
60. See Human Inference 123-24; Kiesler and Munson, Attitudes and Opinions, 26 Ann. Rev. Psychol. 415,429-30(1975). A review of the recent data concludes that both actors and observers tend to attribute more importance to traits than to situations when making attributions, but persons have a greater tendency to attribute causality to the environment when assessing their own actions than when assessing the actions of others. That is, actors commit the fundamental attribution error less than observers do. See Watson, The Actor and the Observer: How Are Their Perceptions of Causality Divergent? 92 Psych. Bull. 682(1982). The evidence most strongly supports the relative salience explanation that the text gives for this phenomenon-- environments have less salience for observers than for actors.

Id. at 698. A second explanation that also has support in the evidence is that of "prediction and control." According to it, actors know their own traits and response patterns; for actors these to some extent are immutable. Thus, actors can maximize "their ability to predict and control future events by focusing on the response requirements of specific situations and on the effects that these situations have on their behavior." Id. at 692. In contrast, observers need to understand the persons with whom they deal; thus they can enhance their ability to predict and control events "by categorizing people according to important trait dimensions." Id. This explanation also is consistent with our view that persons will give appropriate weight to situational factors when assessing their own creditworthiness.

61. The factors that credit managers do and should look at when making consumer loans are summarized in R. Brealey and S. Myers, *Principles of Corporate Finance* 573-76(1981).
62. These conditions are formally derived and explained in Schwartz and Wilde, supra note 27. The following analysis of segmentation is theoretical background to the discussion at pp.38-40 of when firms that offer different warranties actually sell in the same market.
63. Id.
64. See note 31, supra; Schwartz and Wilde, supra note 27. An additional assumption made in our models, that is standard in the economic literature, is that each firm sells a single product;

for example, each firm sells with warranties or without them, but cannot offer different coverages. In actual markets, firms sometimes sell with a standard warranty but offer consumers an optional warranty at extra cost that is either more extensive or of longer duration than the regular warranty. Our analysis does not permit a formal evaluation of this practice, but we suspect that its welfare effects are ambiguous. The gain to consumers is an increased likelihood of getting warranties they want at reduced search costs. If consumers search for desired warranty coverage as well as for low prices, however, the presence of "multicoverage firms" may in fact reduce search, which could cause prices to rise. A similar ambiguous welfare effect could attend regulation that requires firms generally to expand warranty coverage. If consumers would search less because they knew that every firm offers a good warranty, prices could rise. On the other hand, if firms are required to warrant only in the particular cases when they have a comparative advantage at selling without warranties and present search in the market at issue is insufficient to generate a competitive equilibrium, the requirement may produce net welfare gains, administrative costs aside.

65. See A. Donegan, *The Theory of Morality* (1979).
66. This position is strongly argued in R. Goodin, *Political Theory and Public Policy* 39-56(1982), who also cites earlier papers in the same vein. See also Kennedy, Distributional and

Paternalistic Motives in Contract and Tort Law with Special Reference to Compulsory Terms and Unequal Bargaining Power, 41

MD. L. Rev. 563,624-49(1982) (arguing for paternalistic intervention in consumer protection contexts). The phenomenon of changing preferences is discussed in detail in J. Elster, *Ulysses and the Sirens: Studies in Rationality and Irrationality* 36-111(1979). In particular, see 65-89. Elster, however, believes that the welfare state should not be justified on the ground that preferences may change but rather on the apparently

distributionally motivated ground that risk taking should be a partially cushioned activity. *Id.* at 85-86. Such distributional concerns are irrelevant to the analysis here. See note 2, *supra*.

67. See R. Goodin, *supra* note 66, at 12-18. (justifying the project of regulating on the basis of future preferences on utilitarian grounds).

68. See text at note 35, *supra*.

69. This analysis implies that statutes such as those banning all disclaimers in consumer sales or prohibiting creditors from taking nonpurchase money security interests in consumer goods cannot be justified on the ground that imperfect information exists in either of its aspects. Such statutes falsely assume a pervasive incongruence between consumer preferences and consumer contracts. Also, the strict liability in tort doctrine bans all terms that allocate to consumers risks of personal injury or property damage caused by product defects. This doctrine is

justifiable only in the limited circumstances discussed above.

As regards warranty content, the informational assumptions that comparative advantage explanations make thus are less fatal to their conclusions than the critics of these assumptions claim. See text at notes 15-20, *supra*. Comparative advantage theorists, however, miss the problem that correct coverage may be offered at incorrect prices as well as the problem that coverage may be incorrect in the case of inexpensive, frequently purchased, occasionally dangerous goods.

70. An exception to this argument is the case of the low probability, inexpensive, high risk product, such as the soda bottle that explodes. This case, however, should be covered by a general ban of the sort that the strict liability in tort doctrine enacts.

71. See Gerner and Bryant, The Demand for Repair Service during Warranty, 53 J. Bus. 397,413(1980) ("The impact consumers have on . . . repairs. . . may have particular importance in any attempt to label appliances with their expected failure rates, since in part that failure rate will be the result of consumers themselves").

72. *E.g.*, N.Y. Gen. Oblig. Law section 5-702 (McKinney Supp. 1981-82); Conn. Gen. Stat. Ann. sections 42-151-158 (West 1981).

73. See *Intervening in Markets* 673-77. The authorities cited in note 26, *supra*, suggest that substantial price reductions and other gains may flow from production of this kind of data.

74. These methods are thoroughly explored in J. Tydeman, M. Lipinski,

R. Adler, M. Nyhan and L. Zwimpfer, Teletext and Videotext in the United States: Market Potential, Technology, Public Policy Issues (1982).

APPENDIX

SOME RESULTS ON CONSUMER FINANCIAL MARKETS AND SECURITY INTERESTS UNDER IMPERFECT INFORMATION

We are concerned here with consumer financial markets in which lenders may or may not take a security interest in goods for whose purchase they make loans to consumers. Consider a consumer who wishes to finance the purchase of some good, say a car. He or she goes to a lending institution to obtain a loan. The lending institution, a bank, say, charges some interest rate and may or may not wish to take a security interest in the good. The loan is made. Afterwards there is some chance the consumer defaults on the loan payments. This may be because the consumer goes bankrupt or it may be for other reasons. If the consumer defaults, the bank sues for breach of contract. If the consumer is not bankrupt, the bank recovers in full any unpaid principle. Otherwise, how much it recovers depends on whether it has taken a security interest. If the bank has taken a security interest it recovers the good, and if the value of the used good exceeds the unpaid principle it returns the difference to the consumer. However, if the value of the used good is less than the unpaid principle, the bank must sue to recover the difference. Since the consumer is bankrupt, it generally will only recover a portion of this remaining

debt.

If the bank does not take a security interest and the consumer defaults due to bankruptcy, then the entire unpaid principle must be recovered through the courts. Again, only a portion will generally be obtained since the consumer's debts exceed his or her credits. Of interest here is whether banks will request security interests, and how the answer to this question is related to loan rates, and consumer information.

To begin a formal analysis of these issues, we assume all loans are for a fixed amount, L . The probability of default is π and the probability of bankruptcy given default is γ . The rate of recovery in a bankruptcy proceeding is ρ . The value of the used good is V .

We need also to specify the "technology" facing the lending institutions. We assume firms offer loans with or without a security interest but not both. Let r be the interest rate they charge consumers. Let S be the total amount of funds available for consumer loans and $S/L \equiv s$ be the total number of loans that can be made. Let F be the fixed costs associated with lending in this market and c the marginal (or "opportunity") cost, measured as an interest rate, of making loans; i.e. the marginal cost of loaning L dollars is cL . Finally, let F' be any additional fixed costs associated with taking a security interest (essentially the costs of selling used goods on a wholesale market).

On the demand side we assume each consumer desires a loan of L

dollars or none. The total number of consumers is fixed at A . Of these A_1 are nonshoppers and A_2 are shoppers, the latter of whom sample precisely two firms. Initially we assume consumers prefer not to have security interests taken. We let h_N be the limit price (or interest rate) when no security interest is taken and h_S be the limit price (or interest rate) when a security interest is taken.

A summary of notation to be used follows:

L = size of loan
 r = interest rate charged
 π = probability of default
 γ = probability of bankruptcy given default
 ρ = recovery rate in bankruptcy proceeding
 V = value of used good
 S = total funds available
 $s = S/L$ = maximum number of loans
 F = fixed cost with no security interest
 F' = additional fixed cost with security interest
 c = marginal cost of funds (as an interest rate)
 h_N = limit rate given no security interest
 h_S = limit rate given security interest.

In addition we will use the following:

$k \equiv \pi\gamma(1-\rho)$ = expected net marginal loss due to bankruptcy
 r_N^* = competitive interest rate given no security interest
 r_S^* = competitive interest rate given security interest

a_N = breakeven demand for a monopolist taking no security interest

a_S = breakeven demand for a monopolist taking a security interest.

Several assumptions will be used in the analysis which follows. These are given next.

Assumption 1: $L > V$.

This assumption will be used in the following way. To keep things simple, dynamic elements of the problem will be ignored. This will have no qualitative effect but helps the analytics. In particular, all interest rates will be treated as simple interest in a one-period framework. No "down-payments" will be made, and any defaults will occur before any of the principle has been paid. Thus if $L > V$, the used good is worth less than the new good the instant it is purchased. Since many defaults occur after some time has passed and some payments on the loan have been made, this assumption captures the most common case -- that in which a security interest is not adequate to cover the remaining principle given a default.

Assumption 2: $h_N > h_S$.

This assumption is obvious -- consumers are willing to pay more if no security interest is taken than if one is taken. Somewhat stronger is the following.

Assumption 3: $h_N - r_N^* > h_S - r_S^* > 0$.

Assumption 3 states that consumers prefer no security interest to a security interest given the opportunity to take loans with or

without a security interest, but always at the relevant competitive price. The terms $h_N - r_N^*$ and $h_S - r_S^*$ represent consumer surplus and are assumed to be strictly positive.

Two more assumptions, of a more specialized, technical nature, will turn out to be useful.

Assumption 4: $F'/s < Vk$.

Assumption 5: $h_N > Vk/L (1 - \pi)$.

The first two of these assumptions guarantees that $r_N^* > r_S^*$; i.e., the competitive interest rate on a loan with a security interest is less than that on a loan without a security interest. It implies this because F'/s is the additional average cost of taking security interests when the maximum number of loans are made, and Vk is the additional gain per loan from taking a security interest -- with a security interest the value of the used good V is gained before the bankruptcy process is initiated and k is the rate of loss due to being forced into that process. The second assumption is more obscure. It is equivalent to Assumption 3 except that instead of using r_N^* and r_S^* , one uses $(c + k)/(1 - \pi)$ and $[c + k + (Vk/L)/(1 - \pi)]$ respectively. This is the "differentiable" average cost function analogue to our "fixed cost, constant marginal cost, fixed capacity" formulation and is generated by letting $F' = 0 = F$. Its role in the analysis which follows will be made clear below.

To begin this analysis we need to characterize profits as a function of the level of demand, x , and the interest rate charged

consumers, r , for firms who make loans with and without a security interest; denoted $\pi_S(x;r)$ and $\pi_N(x;r)$, respectively. To wit:

Lemma 1:

$$\pi_N(x;r) = Lx[r(1 - \pi) - c - k] - F,$$

$$\pi_S(x;r) = Lx[r(1 - \pi) - c - k] + xVk - (F + F').$$

Proof: Consider first no security interest.

$$\begin{aligned} \pi_N(x;r) &= [(1 + r)Lx - F - (1 + c)Lx] + \pi x[-(1 + r)L + (1 - \gamma)L + \gamma L\rho] \\ &= Lx[r - c + \pi[\gamma(\rho - 1) - r]] - F \\ &= Lx[r(1 - \pi) - c - k] - F. \end{aligned} \quad (1)$$

The first bracketed term in (1) is direct profits if there were no defaults. With x loans, πx is the expected number of defaults. Initially $(1 + r)L$ is lost on each default. But $1 - \gamma$ percent of the defaulters are not bankrupt, and for these the entire principle L is recovered. For bankruptcies, γ percent of the defaults, the recovery rate is ρ . Hence the second bracketed term is net recoveries given default. Similarly,

$$\begin{aligned} \pi_S(x;r) &= [(1 + r)Lx - (F + F') - (1 + c)Lx] \\ &\quad + \pi x[-(1 + r)L + (1 - \gamma)L + \gamma[V + (L - V)\rho]] \\ &= Lx[r - c + \pi[-r - \gamma(1 - \rho)]] + xVk - (F + F') \\ &= Lx[r(1 - \pi) - c - k] + xVk - (F + F'). \end{aligned} \quad (2)$$

The difference between (2) and (1) is the additional fixed cost F' and the additional expected recoveries given default. If the consumer is

bankrupt, V is recovered with certainty and the balance $L - V$ is recovered at rate ρ because only it is forced into the bankruptcy process. Q.E.D.

Using Lemma 1 we can characterize r_N^* and r_S^* explicitly.

Lemma 2:

$$r_N^* = [(F/Ls) + c + k]/(1 - \pi)$$

$$r_S^* = \{[(F + F')/Ls] + c + k - (Vk/L)\}/(1 - \pi).$$

Proof: Competitive interest rates are defined by zero profits at capacity s . Hence for no security interest,

$$0 = \pi_N(s; r_N^*) = Ls[r_N^*(1 - \pi) - c - k] - F,$$

or

$$r_N^* = [(F/Ls) + c + k]/(1 - \pi).$$

Similarly,

$$0 = \pi_S(s; r_S^*) = Ls[r_S^*(1 - \pi) - c - k] + sVk - (F + F')$$

which yields r_S^* .

Q.E.D.

Lemma 1 also allows us to express α_N and α_S formally.

Lemma 3:

$$\alpha_N = F/L[h_N(1 - \pi) - c - k]$$

$$\alpha_S = (F + F')/[L[h_S(1 - \pi) - c - k] + Vk].$$

Proof: By definition a_N and a_S are breakeven demands for monopolists offering loans without and with security interests, respectively.

Hence

$$0 = \pi_N(a_N; h_N) = L a_N [h_N(1 - \pi) - c - k] - F,$$

and

$$0 = \pi_S(a_S; h_S) = L a_S [h_S(1 - \pi) - c - k] + a_S V k - (F + F').$$

Solving for a_N and a_S gives the lemma.

Q.E.D.

A final lemma relating a_N to a_S will turn out to be of use later.

Lemma 4: $a_N < a_S$.

Proof: From Lemma 3 we have $a_N < a_S$ if and only if

$$F/L[h_N(1 - \pi) - c - k] < (F + F')/[L[h_S(1 - \pi) - c - k] + V k]. \quad (3)$$

Simplifying (3), we have $a_N < a_S$ if and only if

$$(h_N - h_S)(1 - \pi) > (V k/L) - (F'/F)[h_N(1 - \pi) - c - k]. \quad (4)$$

But Assumption 3 states $h_N - r_N^* > h_S - r_S^*$ which, using Lemma 2, implies

$$h_N - [(F/Ls) + c + k]/(1 - \pi) >$$

$$h_S - [(F + F')/Ls) + c + k] - (V k/L)/(1 - \pi). \quad (5)$$

Rearranging (5) gives

$$(h_N - h_S)(1 - \pi) > (V k/L) - (F'/SL). \quad (6)$$

Inequality (6) implies inequality (4), and hence the lemma, if

$$(V k/L) - (F'/sL) > (V k/L) - (F'/F)[h_N(1 - \pi) - c - k]. \quad (7)$$

Inequality (7), however, reduces to

$$sL[h_N(1 - \pi) - c - k] - F > 0.$$

But $sL[h_N(1 - \pi) - c - k] - F = \pi_N(s; h_N) > 0$ since $h_N > r_N^*$ by Assumption 3. Thus (7) must hold, implying (4) holds, implying $a_N < a_S$. Q.E.D.

This completes our preliminary analysis. We are now ready to consider the possible equilibrium configurations in more detail. Equilibrium here is a consumer-firm ratio, $\sigma \equiv A/N$, a distribution of firms between those offering loans with security interest, n_S , and those offering loans without security interest, n_N ; and a distribution of interest rates in each market, $G_S(\cdot)$ and $G_N(\cdot)$, such that all firms earn zero profits and no firm can earn positive profits by changing its interest rate. Here

N = total number of firms

N_N = number of firms without security interest

N_S = number of firms with security interest

$n_N = N_N/N$

$n_S = N_S/N.$

Theorems 1 through 8 all presume Assumptions 1 through 5 hold.

Theorem 1: A necessary and sufficient condition for $n_S = 0$ and the market for loans without security interests to be competitive is $a_1 s \leq a_N$.

Proof: With $n_S = 0$ and the security interest market competitive, expected demand at r_N^* must equal s . Hence $\sigma = A/N = s$. A firm entering this market above r_N^* should charge h_N since it gets nonshoppers only. Nonpositive profits thus requires $a_1 \sigma L[h_N(1 - \pi) - c - k] - F \leq 0$, or using Lemma 3, $a_1 \sigma \leq a_N$. A firm entering the security interest market should analogously charge h_S . Nonpositive profits then requires $a_1 \sigma L[h_S(1 - \pi) - c - k] + a_1 \sigma V k - (F + F') \leq 0$, or $a_1 \sigma \leq a_S$. But Lemma 4 shows $a_N < a_S$. Thus $a_1 \sigma \leq a_N$ implies $a_1 \sigma \leq a_S$. Q.E.D.

Theorem 2: $n_N = 0$ and the market for loans with security interests to be competitive is impossible.

Proof: In this case $\sigma = A/N = s$ again, since capacity is insensitive to whether a security interest is taken or not. Now $h_N - r_N^* > h_S - r_S^*$ (Assumption 3) implies there exists an interest rate $\bar{r}_N > r_N^*$ such that $h_N - \bar{r}_N = h_S - r_S^*$. At this interest rate consumers are indifferent to a loan with no security interest and one with a security interest at rate r_S^* . Hence a firm entering the market for loans without security interests at \bar{r}_N will get expected demand equal to s . Profits are then $Ls[\bar{r}_N(1 - \pi) - c - k] - F$ which is strictly positive since $\bar{r}_N > r_N^*$ and

$Ls[r_N^*(1 - \pi) - c - k] - F = 0$ by definition of r_N^* (see proof of Lemma 2). Q.E.D.

Theorem 3: Both markets competitive is impossible.

Proof: The proof of this result is analogous to that of Theorem 2—a firm charging \bar{r}_N and not taking a security interest must necessarily earn strictly positive profits. Q.E.D.

Theorem 4: A necessary and sufficient condition for $n_S = 0$ and the market for loans without security interests to be noncompetitive is $a_N < a_1 s$.

Proof: When $n_S = 0$, the highest interest rate in the market for loans without security interests is h_N . Zero profits thus implies $\sigma a_1 L[h_N(1 - \pi) - c - k] - F = 0$, or $\sigma = a_N/a_1$.

Now consider the distribution of interest rates in the no security interest market, $G_N(\cdot)$. Suppose it has a mass point at r_N^* . Expected demand at r_N^* is

$$\sigma(a_1 + 2a_2[1 - (G_N^*/2)]).$$

Zero profits then implies

$$\sigma(a_1 + 2a_2[1 - (G_N^*/2)])L[r_N^*(1 - \pi) - c - k] - F = 0,$$

or

$$G_N^* = [(a_1 + 2a_2) - (s/\sigma)]/a_2.$$

A noncompetitive distribution of interest rates in the no security

interest market requires $G_N^* < 1$, or $(a_1 + 2a_2) - (s/\sigma) < a_2$. Since $\sigma = a_N/a_1$, this reduces to $a_N < a_1 s$.

What about entry into the market for loans with security interests? To calculate expected profits at various interest rates in this market we need to know the exact form of $G_N(\cdot)$. Expected demand at interest rate r is $\sigma[a_1 + 2a_2[1 - G_N(r)]]$. Hence if we let $\pi_N(x, r)$ when x equals expected demand at r be denoted $\pi_N^e(r)$,

$$\pi_N^e(r) = \sigma[a_1 + 2a_2[1 - G_N(r)]]L[r(1 - \pi) - c - k] - F. \quad (8)$$

Zero profits requires $\pi_N^e(r) = 0$ (for those r actually offered). Hence (8) yields

$$G_N(r) = 1 - \frac{F - a_1 \sigma L[r(1 - \pi) - c - k]}{2a_2 \sigma L[r(1 - \pi) - c - k]}. \quad (9)$$

If a firm enters the market for loans with security interests at rate q_S it loses some shoppers to firms offering loans without security interests. In fact, at rate q_N , where $h_N - q_N = h_S - q_S$, consumers are indifferent, and for any $r < q_N$, they prefer to take a loan without a security interest at rate r rather than take one with a security interest at rate q_S . Thus, defining $\pi_S^e(\cdot)$ analogously to $\pi_N^e(\cdot)$,

$$\pi_S^e(q_S) = \frac{\sigma[a_1 + 2a_2[1 - G_N(h_N - h_S + q_S)]]}{L[q_S(1 - \pi) - c - k] + Vk} - (F + F'). \quad (10)$$

Using (9) in (10) we get

$$\pi_S^e(q_S) = \frac{F[L[q_S(1 - \pi) - c - k] + Vk]}{L[(h_N - h_S + q_S)(1 - \pi) - c - k]} - (F + F'). \quad (11)$$

Differentiating (11) with respect to q_S gives

$$d\pi_S^e(q_S)/dq_S = \frac{FL(1 - \pi)[L(h_N - h_S)(1 - \pi) - Vk]}{L^2[(h_N - h_S + q_S)(1 - \pi) - c - k]^2}.$$

The sign of $d\pi_S^e(q_S)/dq_S$ equals the sign of $L(h_N - h_S)(1 - \pi) - Vk$.

But by Assumption 5, this is positive. Hence $d\pi_S^e(q_S)/dq_S > 0$ and $\pi_S^e(q_S) \leq 0$ for all $q_S \in [r_S^*, h_S]$ if and only if $\pi_S^e(h_S) \leq 0$. But from (11) this reduces to $a_N \leq a_S$, which necessarily holds

given Lemma 4.

Q.E.D.

Theorem 5: $n_N = 0$ and the market for loans with security interests to be noncompetitive is impossible.

Proof:

If $n_N = 0$ then the highest interest rate in the market for loans with security interests is h_S . Zero profits then implies $\sigma = a_S/a_1$. A firm entering the no security interest market at h_N will attract $a_1 \sigma$ customers. Profits are then $a_1 \sigma L[h_N(1 - \pi) - c - k] - F$ which are nonpositive if and only if $a_S < a_N$, a condition which contradicts Lemma 4.

Q.E.D.

Theorem 6:

The market for loans with security interests to be competitive and that for loans without security interests to be noncompetitive is impossible.

Proof: The logic here is the same as in the proofs of Theorems 2 and

3—expected demand at r_S^* is s . A firm offering $\bar{r}_N \equiv h_N - h_S + r_S^*$ will also attract s consumers and must therefore earn strictly positive profits. Q.E.D.

Theorem 7: The market for loans without security interests to be competitive and the market for loans with security interest to be noncompetitive is impossible.

Proof:

This proof follows as that of Theorem 5—zero profits at h_S implies $\sigma = a_S/a_1$ and this consumer/firm ratio necessarily allows strictly positive profits at h_N unless $a_N > a_S$, a condition which violates Lemma 4. Q.E.D.

Theorem 8:

Both markets noncompetitive is impossible.

Proof: To prove this theorem we need first to show there cannot exist two interest rates in the market for security interests, say p_S and q_S , such that $q_N \equiv h_N - h_S + q_S$ and $p_N \equiv h_N - h_S + p_S$ are both offered in the no security interest market. For suppose there were two such interest rates. Expected demand at p_S will equal expected demand at p_N and expected demand at q_S will equal expected demand at q_N . Define these values by $D_S(p_S)$, $D_N(p_N)$, $D_S(q_S)$ and $D_N(q_N)$, respectively. Then zero profits gives

$$\begin{aligned} LD_S(p_S)[p_S(1 - \pi) - c - k] + D_S(p_S)Vk - (F + F') \\ = LD_N(p_N)[p_N(1 - \pi) - c - k] - F \end{aligned} \quad (12)$$

and

$$\begin{aligned} LD_S(q_S)[p_S(1 - \pi) - c - k] + D_S(q_S)Vk - (F + F') \\ = LD_N(q_N)[q_N(1 - \pi) - c - k] - F. \end{aligned} \quad (13)$$

But $p_N = h_N - h_S + p_S$ and $D_S(p_S) = D_N(p_N)$. Hence (12) is equivalent to

$$\begin{aligned} LD_S(p_S)[p_S(1 - \pi) - c - k] + D_S(p_S)Vk - (F + F') \\ = LD_S(p_S)[(h_N - h_S + p_S)(1 - \pi) - c - k] - F, \end{aligned}$$

or,

$$D_S(p_S)Vk - F' = LD_S(p_S)(h_N - h_S). \quad (14)$$

Solving (14) for $D_S(p_S)$ gives

$$D_S(p_S) = F' / [Vk - L(h_N - h_S)(1 - \pi)], \quad (15)$$

which is independent of p_S and thus must hold for q_S as well. Hence p_S equals q_S , and only one such point can exist. But such a point must exist if both markets are noncompetitive. Furthermore, $D_S(p_S) > 0$ if and only if $Vk > (h_N - h_S)(1 - \pi)$, which contradicts Assumption 5. Thus no such point can exist since expected demand there will be negative. Q.E.D.

This completes our analysis of the case in which consumers prefer loans without security interests, given competitive pricing. It can be summarized nicely in the following corollary.

Corollary 1: Under Assumptions 1 through 5, the market for loans with

a security interest can never exist. The market for loans without a security interest is competitive if and only if $a_1 s \leq a_N$. It is noncompetitive if and only if $a_1 s > a_N$.

It should be pointed out that if Assumption 5 does not hold the necessary and sufficient conditions for $n_S = 0$ and the no security interest market to be noncompetitive are more restrictive (Theorem 4), and the possibility of both markets being noncompetitive arises (Theorem 8).

We now want to consider a situation in which consumers prefer to have loans made with security interests if they are priced competitively; i.e., the reduction in price from r_N^* to r_S^* is more than enough to compensate consumers for the presence of the security interest. Some new notation will be needed. In this case we let l_N be the limit rate for loans without a security interest and l_S be the limit rate for loans with a security interest. We also let β_N and β_S be the breakeven demands for monopolists charging l_N for loans without a security interest and l_S for loans with a security interest, respectively. The relevant assumptions for this case are:

Assumption 2': $l_N > l_S$

Assumption 3': $0 < l_N - r_N^* < l_S - r_S^*$.

Assumptions 1 and 4 remain unchanged and the analogue to Assumption 5 can be stated as a lemma.

Lemma 5: $l_N - l_S < V_k/(1 - \pi)L$.

Proof: We know from Assumption 3' that $l_N - l_S < r_N^* - r_S^*$. But $r_N^* - r_S^* = [V_k/L(1 - \pi)] - [F'/sL(1 - \pi)]$. Hence $l_N - l_S < V_k/(1 - \pi)$ if

$$[V_k/L(1 - \pi)] - [F'/sL(1 - \pi)] < V_k/(1 - \pi)L,$$

which obviously holds since

$$0 < \pi < 1.$$

Q.E.D.

Lemma 6:

$$\beta_N = F/L[l_N(1 - \pi) - c - k]$$

$$\beta_S = (F + F')/[L[l_S(1 - \pi) - c - k] + V_k].$$

Proof:

This result follows as Lemma

3.

Q.E.D.

Lemma 1 and 2 are still valid. However, the analogue to Lemma 4 now fails; that is, β_N and β_S bear no particular relation to each other.

Theorems 9 through 16 are analogous to Theorems 1 through 8. All presume Assumption 1, 2', 3' and 4 hold.

Theorem 9:

$n_S = 0$ and the market for loans without security interests to be competitive is impossible.

Proof:

With $n_S = 0$ and all loans with no security interest priced at r_N^* ,

$\sigma = A/N = s$. A firm offering loans with security interests at \bar{r}_S , where \bar{r}_S is defined by $1_S - \bar{r}_S = 1_N - r_N^*$, will also attract s consumers. Profits are then:

$$\pi_S(s; \bar{r}_S) = Ls[\bar{r}_S(1 - \pi) - c - k] + sVK - (F + F'),$$

which are strictly positive since $\pi_S(s, r_S^*) = 0$ by definition and $\bar{r}_S > r_S^*$. Q.E.D.

Theorem 10:

A necessary and sufficient condition for $n_N = 0$ and the market for loans with security interests to be competitive is $a_1 s \leq \min(\beta_N, \beta_S)$.

Proof:

The proof of this result is similar to that of Theorem 1. With $n_N = 0$ and all loans with security interests priced at r_S^* , $\sigma = A/N = s$. Nonpositive profits at 1_S reduces to $a_1 s \leq \beta_S$ and nonpositive profits at 1_N reduces to $a_1 s \leq \beta_N$. Since β_N and β_S bear no special relation to each other, both constraints are relevant. Q.E.D.

Theorem 11:

Both markets competitive is impossible.

Proof: This proof is analogous to that of Theorem 9—a firm charging \bar{r}_S and taking a security interest must necessarily earn strictly positive profits. Q.E.D.

Theorem 12: A necessary and sufficient condition for $n_S = 0$ and the

market for loans without security interests to be noncompetitive is:

$$Vk - L(1_N - 1_S)(1 - \pi) \leq a_1 F' / \beta_N (a_1 + 2a_2).$$

Proof: With $n_S = 0$ and the no security interest market noncompetitive, the highest price in the latter must be 1_N . Hence $\sigma = A/N = \beta_N / a_1$ by zero profits. Furthermore, $G_N(r_N^*) = 0$; there can be no mass at r_N^* , for if there were firms could enter at \bar{r}_S and earn strictly positive profits (see the proof of Theorem 9). Let t_N be the lowest price in the no security interest market actually offered, and define $\pi_N^e(r)$ be equal to $\pi_N(x, r)$ when x is expected demand at r . Then

$$\pi_N^e(t_N) = \sigma(a_1 + 2a_2)L[t_N(1 - \pi) - c - k] - F.$$

Zero profits then gives

$$t_N = \{[F/\sigma L(a_1 + 2a_2)] + c + k\} / (1 - \pi). \quad (16)$$

It must be that $t_N > r_N^*$. Using (16) and Lemma 2, this reduces to $a_1 s > \beta_N(a_1 + 2a_2)$. But this is implied by Assumption 3'.

What about entry into the market for loans with security interests. As in the proof of Theorem 4, we have for any $r \in [t_N, 1_N]$,

$$\pi_N^e(r) = \sigma[a_1 + 2a_2[1 - G_N(r)]]L[r(1 - \pi) - c - k] - F.$$

Using $\pi_N^e(r) = 0$ this gives

$$G_N(r) = 1 - \frac{[F - a_1 \sigma L[r(1 - \pi) - c - k]]}{2a_2 \sigma L[r(1 - \pi) - c - k]}. \quad (17)$$

Let t_S be defined by $1_S - t_S = 1_N - t_N$. Then for any $q_S \in [t_S, 1_S]$,

$$\pi_S^e(q_S) = \frac{\sigma[a_1 + 2a_2[1 - G_N(1_N - 1_S + q_S)]]}{[L[q_S(1 - \pi) - c - k] + Vk]} - (F + F'), \quad (18)$$

where $\pi_S^e(\cdot)$ is defined analogously to $\pi_N^e(\cdot)$. Using (17) in (18), we get

$$\pi_S^e(q_S) = \frac{F[L[q_S(1 - \pi) - c - k] + Vk]}{L[1_N - 1_S + q_S](1 - \pi) - c - k} - (F + F'),$$

and differentiating,

$$\partial \pi_S^e(q_S) / \partial q_S = \frac{FL(1 - \pi)[L(1_N - 1_S)(1 - \pi) - Vk]}{L^2[(1_N - 1_S + q_S)(1 - \pi) - c - k]^2}.$$

Now Lemma 5 implies the bracketed term in the numerator is negative.

Hence we need only guarantee $\pi_S^e(t_S) \leq 0$ to prevent entry in the no security interest market. But $t_S = 1_S - 1_N + t_N$. Hence

$$\pi_S^e(t_S) = \frac{F[L[(1_S - 1_N + t_N)(1 - \pi) - c - k] + Vk]}{L[t_N(1 - \pi) - c - k]} - (F + F').$$

Using (16) this reduces to

$$\pi_S^e(t_S) = \sigma(a_1 + 2a_2)[Vk - L(1_N - 1_S)(1 - \pi)] - F'.$$

Since $\sigma = \beta_N/a_1$, $\pi_S^e(t_S) \leq 0$ can be stated in the form given in the Theorem. Note that Lemma 5 implies $Vk - L(1_N - 1_S)(1 - \pi) > 0$ so this constraint is nontrivial when $F' > 0$. Q.E.D.

Theorem 13: Necessary and sufficient conditions for $n_N = 0$ and the market for loans with security interests to be noncompetitive are:

$$(i) \quad \beta_S < a_1 s,$$

$$(ii) \quad \beta_S \leq \beta_N.$$

Proof: With $q_N = 0$, the highest rate in the securities market must be 1_S . Zero profits then implies $\sigma = \beta_S/a_1$. To guarantee that $G_S(\cdot)$ is nondegenerate we follow the usual procedure (see the proof of Theorem 4 for example): assume a mass point exists at r_S^* , use zero profits to calculate its size, and then require it to be strictly less than 1. This yields $\beta_S < a_1 s$, condition (i).

Condition (ii) is also given by standard arguments regarding nonentry in the no security interest market. Using zero profits we show for $r > r_S^*$,

$$1 - G_S(r) = [(F + F')/\sigma[L(r(1 - \pi) - c - k)]] - a_1/2a_2.$$

Hence for $q_N \in [r_N^*, 1_N]$,

$$\pi_N^e(q_N) = \frac{(F + F')L[q_N(1 - \pi) - c - k]}{L(1_S - 1_N + q_N)(1 - \pi) - c - k} - F,$$

and

$$d\pi_N^e(q_N)/dq_N = \frac{(F + F')L(1 - \pi)[L(1_S - 1_N)(1 - \pi) + Vk]}{L[(1_S - 1_N + q_N)(1 - \pi) - c - k] + Vk}.$$

Thus Lemma 5 implies $d\pi_N^e(q_N)/dq_N > 0$ and we need only guarantee that $\pi_N^e(1_N) \leq 0$. Thus, however, reduces to $\beta_N \geq \beta_S$, condition (ii). Q.E.D.

Theorem 14: Necessary and sufficient conditions for the market for

loans with security interests to be competitive and that for loans without security interests to be noncompetitive are:

$$(i) \beta_N < a_1 s$$

$$(ii) V_k - L(1_N - 1_S)(1 - \pi) < a_1 F' / [2a_1 s - (a_1 + 2a_2)\beta_N].$$

Proof:

With the no security interest market noncompetitive and the security interest market competitive, the highest rate charged in the former must be 1_N . Zero profits then gives $\sigma = \beta_N / a_1$.

As usual, $G_N(\cdot)$ cannot have a mass point at r_N^* (see Theorems 9, 11 and 12). Furthermore, expected demand at r_S^* must equal s .

Hence

$$\sigma(a_1 + 2a_2[n_N + (n_S/2)]) = s,$$

or using $n_N + n_S = 1$ and $\sigma = \beta_N / a_1$,

$$n_N = [(a_1 s / \beta_N) - 1] / a_2.$$

Hence $n_N > 0$ yields $a_1 s > \beta_N$ and $n_N < 1$ yields $a_1 s < \beta_N(a_1 + 2a_2)$.

However, the latter is implied by Assumption 3'. Hence we have (i).

Let t_N be the minimum rate charged in the no security interest market. Then zero profits implies

$$\sigma(a_1 + 2a_2 n_N)L[t_N(1 - \pi) - c - k] - F = 0,$$

or

$$t_N = \{[F / (2s - (a_1 + 2a_2)\sigma)L] + c + k\} / (1 - \pi).$$

Hence $t_N > r_N^*$ if and only if $\beta_N(a_1 + 2a_2) > a_1 s$, the same constraint associated with $n_N < 1$.

Consider, finally, entry into the security interest market above r_S^* . Following the standard procedure we have

$$1 - G_N(r) = \{[F / \sigma L(r(1 - \pi) - c - k)] - a_1\} / 2a_2 n_N$$

and

$$\pi_S^e(q_S) = \frac{F[L(q_S(1 - \pi) - c - k) - V_k]}{L(1_N - 1_S + q_S)(1 - \pi) - c - k} - (F + F').$$

Thus

$$d\pi_S^e(q_S)/dq_S = \frac{FL(1 - 1_N - 1_S)(1 - \pi) - V_k}{\{L[(1_N - 1_S + q_S)(1 - \pi) - c - k]\}^2}.$$

Lemma 5 then implies $d\pi_S^e(q_S)/dq_S \leq 0$, so we need $\pi_S^e(t_S) \leq 0$, or after some algebra,

$$V_k - L(1_N - 1_S)(1 - \pi) < a_1 F' / [2a_1 s - (a_1 + 2a_2)\beta_N],$$

condition(ii).

Q.E.D.

Theorem 15: The market for loans without security interests to be competitive and the market for loans with security interests to be noncompetitive is impossible.

Proof:

Firms could always enter the securities market at \bar{r}_S and earn

strictly positive profits (see Theorems 9 and 11).

Q.E.D.

Theorem 16: Necessary and sufficient conditions for both markets noncompetitive are

- (i) $(a_1 + 2a_2)\beta_N[Vk - (1_N - 1_S)(1 - \pi)L] > a_1F'$
- (ii) $F' > \beta_N[Vk - (1_N - 1_S)(1 - \pi)L]$
- (iii) $a_1F' < [Vk - (1_N - 1_S)(1 - \pi)L][2a_1s - (a_1 + 2a_2)\beta_N]$

Proof: The first step in this proof is to show that the maximum price in the no security interest market is 1_N and the maximum price in the security interest market is strictly less than 1_S . For suppose the opposite is the case (both 1_N and 1_S cannot be offered). As in Theorem 8, there can exist only one rate, say p_N , such that both p_N and p_S are offered, where p_S is defined by $1_N - p_N = 1_S - p_S$. At p_N , expected demand is $\sigma(a_1 + 2a_2n_S)$ since p_N is the highest rate in the no security interest market (and by assumption $p_N < 1_N$). But expected demand at p_S is also $\sigma(a_1 + 2a_2n_S)$. Hence zero profits yields

$$\begin{aligned} & \sigma(a_1 + 2a_2n_S)L[p_N(1 - \pi) - c - k] - F \\ &= \sigma(a_1 + 2a_2n_S)\{L[p_S(1 - \pi) - c - k] - Vk\} - (F + F'). \end{aligned}$$

or

$$\sigma(a_1 + 2a_2n_S) = F' / [Vk - L(1_N - 1_S)(1 - \pi)].$$

Solving for n_S ,

$$n_S = [(F' / Z\sigma) - a_1] / 2a_2$$

where $Z = [Vk - L(1_N - 1_S)(1 - \pi)]$. We need $0 < n_S < 1$, or

$$(a_1 + 2a_2)\sigma Z > F' > a_1\sigma Z. \quad (19)$$

Next, let q_N be the minimum rate in the no security interest market. It must be that $q_N > r_N^*$ or entry at \bar{r}_S would yield strictly positive profits. But consider entry in the security interest market at q_S , where q_S is defined by $1_N - q_N = 1_S - q_S$. Zero profits at q_N implies

$$\sigma(a_1 + 2a_2)L[q_N(1 - \pi) - c - k] - F = 0,$$

or

$$q_N = \{[F / \sigma(a_1 + 2a_2)L] + c + k\} / (1 - \pi).$$

Thus

$$\begin{aligned} \pi_S^e(q_S) &= \sigma(a_1 + 2a_2)[L[q_S(1 - \pi) - c - k] + Vk] - (F + F') \\ &= \sigma(a_1 + 2a_2)\{L[1_S - 1_N + q_N(1 - \pi) - c - k] + Vk\} - (F + F'). \end{aligned}$$

Substituting for q_N and requiring $\pi_S^e(q_S) \leq 0$ gives

$$L(1_S - 1_N)(1 - \pi) + Vk \leq F' / \sigma(a_1 + 2a_2)$$

or

$$\sigma(a_1 + 2a_2)Z \leq F'$$

which contradicts the left-hand inequality in (19) — $n_S < 1$.

Thus it must be that the maximum rate in the no security interest market is 1_N and in the security interest market it is p_S ,

where p_S is defined as above. The minimum price in the no security interest market is p_N , where p_N and p_S satisfy $l_S - p_S = l_N - p_N$.

As before, we can solve for expected demand at p_N and p_S .

Here we have that it equals $\sigma(a_1 + 2a_2 n_N)$ and thus

$$\sigma(a_1 + 2a_2 n_N) = F'/Z.$$

Thus $0 < n_N < 1$ implies

$$(a_1 + 2a_2)\sigma Z > F' > a_1\sigma Z \quad (20)$$

as in (19). It must also be that $p_N > r_N^*$. But p_N is given by

$$L\sigma(a_1 + 2a_2 n_N)[p_N(1 - \pi) - c - k] - F = 0,$$

or

$$p_N = [(FZ/F'L) + c + k]/(1 - \pi).$$

Thus $l_N > p_N > r_N^*$ if and only if

$$\beta_N Z < F' < sZ, \quad (21)$$

the first of these being equivalent to $n_N > 0$ and the second to Assumption 3'.

Two considerations remain: nondegeneracy of $G_S(\cdot)$ and entry above p_S or below p_N . Concerning the former, suppose $G_S(\cdot)$ has a mass point at r_S^* . Then zero profits implies

$$\sigma[a_1 + 2a_2(n_N + n_S(1 - G_S(r_S^*))/2)] = s,$$

or

$$G_S(r_S^*) = [2(a_1 + 2a_2) - (s/\sigma)]/[a_1 + 2a_2 - (F'/\sigma Z)].$$

Thus $G_S(r_S^*) < 1$ if and only if

$$a_1 F' < Z[2a_1 s - (a_1 + 2a_2)\beta_N]. \quad (22)$$

Concerning entry above p_S , $d\pi_S^e(r)/dr < 0$ for $r \in [p_S, l_S]$ (as in Theorem 12). For entry below p_N , $d\pi_N^e(r)/dr > 0$ for $r \in [r_N^*, p_N]$ (as in Theorem 13). Hence zero profits at p_S and p_N covers these two cases.

Substituting $\sigma = \beta_N/a_1$ into (20), (21) and (22) and using

$$Z = Vk - (l_N - l_S)/(1 - \pi)L \text{ gives the theorem.} \quad \text{Q.E.D.}$$

These results can be summarized in the following Corollary.

Corollary 2:

(i) A competitive equilibrium in the market for loans with security interests with $n_N = 0$ exists if and only if

$$a_1 s \leq \min\{\beta_N, \beta_S\}.$$

(ii) A noncompetitive equilibrium in the market for loans without security interests with $n_N = 0$ exists if and only if (a) $\beta_S \leq \beta_N$ and

$$(b) \beta_S < a_1 s.$$

(iii) $n_N > 0$ if and only if $\beta_N < \min\{a_1 s, \beta_S\}$. Furthermore $n_S = 0$ if and only if $[Vk - L(l_N - l_S)(1 - \pi)]\beta_N(a_1 + 2a_2) \leq a_1 F'$.

These conditions are exhaustive and mutually exclusive.

Proof: Parts (i) and (ii) follow from Theorems 10 and 13. The negative of these cases is equivalent to $\beta_N < \min\{a_1 s, \beta_S\}$. The

necessary and sufficient conditions for each of these cases reduce to:

$$12: \quad Z\beta_N(a_1 + 2a_2) \leq a_1 F'$$

$$14: \quad Z[2a_1 s - (a_1 + 2a_2 \beta_N)] < a_1 F'$$

$$16: \quad Z\beta_N(a_1 + 2a_2) > a_1 F'$$

$$F' > \beta_N Z$$

$$a_1 F' \leq Z[2a_1 s - (a_1 + 2a_2 \beta_N)],$$

where $Z = V_k - L(1_N - 1_S)(1 - \pi)$. But $F' > \beta_N Z$ is equivalent to $\beta_N < \beta_S$ and this is implied by $\beta_N < \min\{a_1 s, \beta_S\}$. Furthermore, the necessary and sufficient conditions for Theorem 16 which remain are the negation of those for Theorems 12 and 14. Thus when $\beta_N < \min\{a_1 s, \beta_S\}$ one of the three cases must hold. Q.E.D.